Impacts of an HIV counseling and testing initiative -- results from an experimental intervention in a large firm in South Africa

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journal or publication title	IDE Discussion Paper
volume	597
year	2016-04-01
URL	http://hdl.handle.net/2344/1553

INSTITUTE OF DEVELOPING ECONOMIES

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IDE DISCUSSION PAPER No. 597

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April 2016

Abstract

We have run experimental interventions to promote HIV tests in a large firm in South Africa. We combined HIV tests with existing medical check programs to increase the uptake. In the foregoing survey we undertook previously, it was suggested that fears and stigma of HIV/AIDS were the primary reasons given by the employees for not taking the te st. To counter these, we implemented randomized interventions. We find substantial heterogeneity in re sponses by ethnicity. Africans and Colored rejected the te sts mo st of ten. Supportive information increased the uptake by 6 to 16% points. A tradeoff in targeting resulting in stigmatizing the targeted and a reduction of exclusion error is discussed.

Keywords: HIV, stigma, RCT, testing, corporate setting
JEL classification: I19, J16

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Impacts of an HIV Counseling and Testing Initiative: Results from an Experimental Intervention in a Large Firm in South Africa*

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Abstract We have run experimental interventions to promote HIV tests in a large firm in South Africa. We combined HIV tests with existing medical check programs to increase the uptake.

In the foregoing survey we undertook previously, it was suggested that fears and stigma of HIV/AIDS were the primary reasons given by the employees for not taking the test. To counter these, we implemented four interventions: delayed notification, opt out, risk assessment, supportive information. Delayed notification allows one week moratorium of notification of results to curve immediate fear. Opt out asks subjects to opt out the test if one does not to take one thereby reducing stigma of testing. Risk assessment involves nurses to give immediate feedback on the set of questions on risky behavior to correct beliefs about infection. Under supportive information, subjects are shown a five minute DVD that encourages testing to reduce both fears and stigma of testing and HIV/AIDS.

Virtually no one exercised the option of delayed notification, so we used it as a control arm. We find substantial heterogeneity in responses by ethnicity. Africans and Colored rejected the tests most often. Supportive information increased the uptake by 6 to 16% points. We therefore conjecture that fears and stigma of testing and HIV/AIDS were reduced to increase the uptake through supportive information provision.

For policy purposes, we introduce the concept of detection probability using uptake and infection probabilities. We found that, despite lower uptake rates, detection rates of seropositive cases among African-Colored are greater than the other groups. This implies that they are of most-at-risk population among the employees. We also found that nurse's risk assessment tended to pick up a larger fraction of safer individuals, thus loweing the detection rates.

Keywords HIV/AIDS, fear, stigma, randomized control trials in firms, South Africa.

* We would like to thank Katsumi Hirano, Dorit Posel, Ayako Honda, Cathy Mathews, Jonny Myers, Stan Du Plessis, Monica Du Toit, Jaco Brink, Brendan Maughan-Brown, seminar participants at University of KwaZulu Natal, University of Cape Town, Stellenbosch University for their comments. We also would like to thank Yasuhisa Morita, Thapelo Molapo, Matt Morito, Muhammad Minty, Suma Madonda and the members of health services for their supports on the project, Phindile Makopo, Ann Jarvis for their devoted management of the experiment. The research is funded by grants from Ministry of Economy, Trade, and Industry of Japan. Research design was approved by the Research Ethics Committee of IDE in May 19, 2010. We declare no conflict of interests among authors. Usual disclaimer applies and all remaining errors are ours.

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I Introduction

In rolling out HIV tests to general public, a popular approach beyond voluntary counselling and testing (VCT) is provider initiated counselling and testing (PICT) at medical facilities. Under PICT, a patient who visits to a health care facility for any ailment will be asked to take a test. While this should give a good opportunity for population in need of medical care, this is likely to leave healthy and sexually active population out of check. One potentially fruitful yet untapped source of at-risk population can be found in the corporate sector. Employees at corporate sector are likely to have stable and high earnings which can make them more demanded in the dating market.

We ran HIV test promotion involving randomized control trials (RCTs) in a large manufacturing firm in South Africa. As a prepatory stage, we have conducted a survey to all employees on their knowledge, aptitude, perception, and behavior (KAPB) on HIV/AIDS. Based on their responses, we have identified fears and stigma as primary deterrents to test uptake. To remove stigma, we have incorporated HIV tests in their medical surveillance program (MSP) which is mandatory for employees with occupational health concerns. For the remainder of employees and executives, we have instituted a simpler version of MSP, health counselling and testing (HCT), which involves tests for chronic conditions and HIV.

We found the uptake rates among employees increased dramatically from the pre-intervention period, yet there are limited overall impacts of experimental interventions that are intended to reduce fears and stigma. When we decomposed the impacts by ethnicity, we found substantial heterogeneity and interventions are uniformly less effective for Africans and Colored, the majority of population and presumably being higher at risk. Despite the stronger test aversion by Africans and Colored, the promotion nevertheless resulted in larger number of detection of HIV positive cases among them.

The rest of paper is organized as follows. In Section II, we review the background of HIV/AIDS prevalence in South Africa, and in Section III existing literature on fears and stigma on HIV uptake is discussed. In Section IV, we discuss the design of the interventions, and in Section V, we show the results of randomization and outcomes. In Section VI, we show the estimated results and discuss interpretations. In Section VII, we conclude and give policy recommendations.

II Background

South Africa has the largest number of People Living with HIV/AIDS in the world. According to UNAIDS (2012), estimated 5.6 million, or 10.6% of total population, represent 23.8% of the disease burden in sub-Saharan Africa, which makes up about a sixth of the global disease burden. In 2008, the estimated HIV prevalence rate among adults between ages 25 and older was 16.8%. While the national prevalence rates plateaued from 2002, the province of KwaZulu Natal, where our study site is located, saw an increase in adult prevalence rates from 11.7% in 2002 to 15.8% in 2008 (Shisana, O. et al. and Team, 2009).

Under the previous policy of encouraging VCT, South Africa did not achieve significant reduction in the rate of newly infected adults. It also failed to meet the national target in cumulative HIV test uptake, which achieved 47% between 2004 and 2009 (Table 1). In an aim to turn this tide around, South African government introduced a new guideline on HIV counseling and testing in August, 2010. The new guideline was expanded to include a number of new components, and is characterized by its proactive approach in reaching out the at-risk population. These components include a revision

Table 1: Cumulative HIV test uptake, 2004 - 2009

province	estimated population	target population	number tested	% of target tested
Eastern Cape	6,884,482	2,737,815	1,267,394	46
Free State	2,972,983	1,479,942	405,399	27
Gauteng	9,853,543	5,308,415	1,668,087	31
KwaZulu Natal	10,077,620	4,578,031	2,268,963	50
Limpopo	5,357,949	2,275,491	1,350,641	59
MP	3,646,123	1,660,038	739,226	45
North West	3,229,078	1,537,093	1,109,242	72
Northern Cape	1,108,599	485,391	282,211	58
Western Cape	4,945,732	2,203,620	1,481,729	67
Total	48,076,109	22,265,836	10,572,892	47

Source: Table 1 of South African National AIDS Council (2010).

Note: Repeated testing by same individual is not taken into account.

Table 2: Corporate HIV/AIDS Policies

countries	firms	HA policy	preven prog	VCT	ART
Southern African countries	225	83	86	56	38
South Africa	96	92	91	72	41
Large (> 500 employees)	107	85 – 90	98	74	40
Medium (100-500 employees)	196	65 – 70	78	47	17
Small (< 100 employees)	691	15 – 20	34	15	3
Financial sector	43	81	79	60	38
Mining sector	92	60	61	57	26
Manufacturing sector	317	47	65	34	11
Transport sector	111	52	61	34	15
Motor	38	24	44	21	9
Wholesale sector	77	25	40	23	3
Construction sector	201	24	31	15	3
Retail sector	153	12	27	13	4

Source: Table 3 of Mahajan et al. (2007).

of counseling protocols as well as a shift for PICT[*2] (South African National AIDS Council, 2010). Naturally, medical facilities became the focal points of interventions.

In the new guideline, the corporate sector is given little attention. It is well known that large firms in South Africa are complying with the legal framework for HIV/AIDS and almost all of them have some sort of prevention programs (see Table 2).[*3] In a survey conducted to major business establishments, 81.25% of surveyed firms have HIV policies in their companies and subsidiaries

[*2] Sometimes called as HIV Counseling and Testing (HCT). We avoid this terminology in this paper as we use HCT for Health Counseling and Testing.

[*3] The South African government mandates the corporate sector to provide supports to employees with HIV/AIDS care and to protect the rights of PLWHA. In 2000, business sector also reacted to a spate of HIV infections and established a non-profit organization (South African Business Coalition on HIV/AIDS, SABCOHA) to promote good practices and share information.

(Bendell et al., 2003). Corporate sector has potential advantages in rolling out HIV test.[*4] Despite its potential, little is known about the achievements and efficacy of HIV/AIDS programs in the corporate sector.[*5] To the best of our knowledge, there is no observational study with rigorous assessment of causal impacts nor experimental evidence on corporate HIV/AIDS interventions.[*6] Any policy implications from this study will be relevant and benefitial to large firms in establishing workable program on HIV testing.

From policy makers perspectives, a program like ours should be of an interest on two grounds. First, it is imperative for stopping the spread of the disease that the general test uptake rates to increase, because self-protection and stopping contagion of HIV must start with knowing own status. Increasing the uptake under the corporate setting is helpful as it has little overlap in targeted population with other programs placed in medical faclities and in communities. Second, knowing the type of interventions that is most efficient in detecting HIV positive cases, or the detection rates, should be benefitial in formulating policies. Detection rate, defined as the number of HIV positive cases found among the number of people who were offered a test, is a useful indicator for policy makers under a limited resource setting where one must pick the most effective tool in detecting the HIV positive cases. We will therefore also consider not just the uptake rates but also the detection rates under each treatment arms.

III Existing literature

In 2009, we have conducted interviews to all employess in the Company on their knowledge, aptitude, perception, and behaviours (KAPB). We have found that employees cite intrinsic fears towards disease (Deblonde et al., 2010; Jurgensen et al., 2012) and stigma to be the major deterrents to testing (Arimoto et al., 2012). We have taken these evidence seriously and designed our experimental

[*4] Most of advantages of corporate sector interventions originate from the facts that there are many, prime age people in a firm and that it is a structured organization. Ease of access to individuals, structured and functioning lines of command to allow effective implementation and follow up, availability of medical infrastructure (on site) and personnel who will be responsible for the program, availability of pre-existing information on individuals to fine-tune intervention design, assurance given to individuals on the availability of treatments, assurance of job security (under an assumption of adherence to rule of law), and financial stability are such examples. This obvious upside is accompanied with disadvantages that are usually found in a corporate society. They are: a tightly knit community that will make anonymity difficult to assure, history of organizational disputes that can impede effective communications among managers and employees, fear of corporate punitive actions toward PLWHA, possible negative short term impacts on productivity, reluctance/sabotage by the personnel who fear additional workload and/or negative evaluations in the case of failure (See the Adam effect in List, 2011).

[*5] When companies run programs, the experiences are rarely documented and shared publicly. Even when it is documented, it is mostly a case study which does not identify causal relationships. For example, Daly et al. (2002) cites several corporate cases and hints causal impacts on various outcome measures without paying due attention to identifiability of underlying parameters they are estimating.

[*6] The only exception is the mining sector. Mining typically has employees to live close to the workplace, and some employers provide lodging. This gives rise to the necessity of the employers to provide essential health care, which includes prevention and treatments to HIV/AIDS. Mining has a peculiar advantage in offering tests and care to the employees due to proximity of residential facilities, as they can allow outpatient visits off working hours, which can mask the individual decisions regarding HIV/AIDS from coworkers. It is relative more advantageous than the pure community setting interventions as the corporate structure allows them to achieve better adherence of drug regimen. Given that the rest of the corporate sector does not enjoy the advantage of work-home proximity, in addition to relatively small weight of the mining sector in terms of labor force (6.2% of all employment at the end of third quarter of 2011 (Africa, 2011), HIV/AIDS promotion experience under non-mining setting will help South African corporates as an important source of reference.

interventions to reduce fears and stigma.

There are several influential studies that set out the definitions of stigma. Van Brakel (2006) shows that previous works focused on measurement have dealt with the following HIV stigma categories: (1) discrimination incidence, (2) attitude toward PLWHA, (3) institutional practices, (4) perceived stigma. After the literature search (see Appendix A for the summary), we adopt UNAIDS (2003)'s definition and its explanation to be most straightforward, inclusive of all four categories in the above, and relevant under our context: "a process of devaluation of people either living with or associated with HIV and AIDS". As fear is relatively understudied, we will devise our own working definition: "Reluctance or aversion to face the disease (even in isolation of social repercussions)".

Economic literature closely related to stigma can be found in the analysis of "acting White" by Austen-Smith and Fryer (2005); Fryer and Torelli (2010). In it, the costs of acts against peer group acceptance alters individual actions, resulting in suboptimality.[*7] By analogy, to maintain peer group acceptance by not showing connections with HIV/AIDs, individuals may choose not to get tested for HIV/AIDS even if they know that it is meritous.

There is a good load of studies that blame stigma as the root cause of low uptake rates of HIV tests. Impacts of stigma is not clearly identified in the previous literature, despite its popularity in concepturization (Berger et al., 2001; Bendell et al., 2003). This is because stigma is difficult to measure, and this makes it also difficult to establish the causal relationship on uptake. In measuring stigma, previous studies have relied on descriptive assessment or self-reported feeling of stigma in the questionnaire, typically in Lickert scales (Berger et al., 2001; MacQuarrie et al., 2009). While these self-reported measures are informative, they are ordinal in nature and cannot be used directly as covariates in estimation.[*8]

Even if we can measure stigma, it is considered to suffer from an omitted variable bias in estimating its impacts on uptake decisions. For example, a person who is very careful may consider the chance of being stigmatized by test taking to be large, at the same time he has a less reason to take tests, causing a negative correlation between stigma and regression residuals, which inflates the magnitude of estimated (presumably negative) stigma impacts, had it been regressed in the absense of carefulness variable. It is difficult to find variables that can influence stigma but not uptake, or an instrumental variable, in the absense of RCT. Even with an RCT, one still cannot directly measure stigma, so one should note that any study that claims to have reduced stigma that resulted in increased uptake rates is in fact testing for the joint hypothesis of having been able to alter stigma-reduction factors and these factors have reduced stigma impacts on uptake.

The impacts of stigma is considered to be negative on the uptake. First line of studies use subjective information, which is subject to aforementioned limitations (Herek et al., 2003; Simbayi et al., 2007; Kalichman and Simbayi, 2003; Mills, 2006; Wolfe et al., 2008). Impacts of fears and stigma have rarely been examined empirically with objective data wiith an exception of Young and Bendavid (2010). Prospective studies are also rare (Perry et al., 1991; Simpson et al., 1998; Young et al., 2007). Simpson et al. (1998) show that a direct offer of test increases the chance of uptake but a brief session with midwives does not. In the economics literature, Godlonton and Thornton (2012);

[*7] Authors show that it alters for the people of middle ability. In equilibrium, they invest less than optimal on own human capital.

[*8] The availability of panel data allows the use of Lickert scales if estimated with ordered conditional logit model of Chamberlain (1980). However, it requires the reported measures to be time-variant (due other than to errors in self-evaluation). This is more plausible when stigmatizing factors change due to successful policies, but in when measured in a short interval so introspective consistency of measures is reasonably kept.

Ngatia (2011) give the cleanest evidence by using a randomized control trial in rural Malawi, and find that stigma or peer pressures reduce uptake. Note that both studies do not measure stigma, so neither of them measured the direct impacts of stigma on uptake, but a joint hypothesis as written in the above.

Fear is relatively understudied in the context of HIV. It is suggested that receiving results also becomes an impediment to know one's status. In a study measuring returns for STD test results to 258 at-risk adolescents who have voluntarily come to the clinic in Cleveland, US between 1997 and 1998, 58% choose not to return to be notified the results (Lazebnik et al., 2001). The returners are more likely to have had private health insurance, unprotected sex while using illegal drugs and alcohol, and previous attendance at the clinic only for HIV testing. This behaviour is consistent with hyperbolic discounting of Ainslie and Haslam (1992); Laibson (1997), or resultant procrastination.

IV Design

IV.1 Logistics of Interventions

We have combined HIV testing and intervention to medical surveillance program (MSP) that is currently offered to most of employees in the production line. MSP is compulsory for employees with occupational health concerns. We combined them primarily to avoid duplications in health care operations and minimize loss of employee time. It also had a benefit of masking employees from their HIV test taking choices, as it is indistinguishable for casual observers and colleagues between an employee just going for health checks and an employee receiving health checks and taking an HIV test. However, these effects cannot be identified as we only offered HIV tests at MSP venues for MSP eligible employees, because we did not have any other means to offer but at MSP venues.

Production lines are controlled in units called a "group", and employee substitution is managed by the group leaders. Group leaders are asked by the MSP coordinator to release group members, and leaders substituted the posts of released members to keep the production line running while they are at the clinic. Groups with fewer absence are given a priority for employee release.

For administrative employees, we have offered division-wide health-day event called Health Counselling and Testing (HCT) that gives a chance to take HIV tests and checks for other chronic conditions (cholesterol, blood sugar, blood pressure).[*9] HCT is voluntary in nature and there is self-selection among the target population when they participate. So we cannot interpret the estimated results as the population impacts, rather, they are impacts on the sub population who agreed to come to HCT by leaving their posts. As we will see below, there is significant self-selection in HCT sample.

According to the agreed on schedule, each area releases employees one after another to the testing venue. All the testing venues are on site; Company's main, satellite, and mobile clinics for MSP-eligible employees, and the conference rooms that are set up for HCT for MSP-ineligible employees. Testing venues for each areas were chosen to minimize the travel distance and to control the workload of nurses. If the nearest clinic is too far, we used the mobile clinics. At the time we requested cooperation to the area managers, we also encouraged to launch their own test taking campaigns in

[*9] We have also spared a capacity for walk-ins who would want to get tested for chronic conditions and HIV. This is reserved as our interventions were scheduled by areas (the unit used for plants and administrative departments), and we found it unethical to keep the employees in areas that are scheduled at later months waited for their turn even when they feel like to be tested immediately. Walk-in employees are tested at the main and satellite clinics.

their area. Thus the area fixed effects in estimation also control for such differences in area wise efforts in promoting uptake.

At each clinic testing venue, an employee is asked to do all the routine health checks. Having finished them, he/she is taken to a room to be offered an HIV rapid test. On supportive information arm days, employees are shown a five minute long video that encourages testing. Employees are always given a pretest counselling after they decided to take tests. Then a rapid test is administered by a nurse and results are given. After the results are notified, post test counselling is given regardless of the test outcomes.[*10] Employees walk out of the room after it. We have asked nurses to give time for employees who reject the tests, so they will stay in the room long enough that no onlookers will know if employees have taken a test just by measuring the duration. At each HCT testing venue, the same procedure is followed.

As we expect the differences in employee release and uptake rates by area, it is necessary to introduce area fixed effects in estimation. This forced us to randomize arms daily to avoid the perfect collinearity between areas and arms. On each morning, a particular arm is announced and the announced arm is implemented in all the testing venue for the same day. Preparations of paperwork for the next day's arm is done in the afternoon.

IV.2 Measures to increase uptake

Following Perry et al. (1991), we have devised an arm of supportive information under which subjects are shown a five minute video that encourages HIV testing. In it, the CEO of the company appears to show management's support to the tests and treatment, a doctor explains the disease and treatments, company's non-discrimination policies and treatment supports through their Health Services, and, lastly, PLWHA colleagues talk about the treatment they receive and recommend the tests. This arm is intended to reduce both fears and stigma of HIV tests. Also, following the current practice, we have tried the opt out arm where the default option is taking rather than not taking the test. By changing the default option, it is assumed that test taking stigma is reduced, because everyone else is considered to be taking the test.[*11]

Nurses gave feedback on the past risky behavior of subjects under risk assessment arm. These include questions on condom use, casual sex partners, and their likeliness of getting infection. This was intended to correct the misinformation or wrong knowledge about HIV/AIDS which may be held by subjects. This can reduce or increase fear, so we instructed nurses not to magnify the fear. It can also affect stigma as they learn more about the treatment, and we instructed nurses to reduce anxiety about peer acceptance. So our prior on risk assessment is to reduce both fears and stigma. Note

[*10] For all the positive cases, we ran confirmatory testing using Eliza whose results are notified within a week's time. This was done as, during the discussions with health service personnel, it was considered to be unethical not to run confirmatory tests to positive cases on rapid tests, given that we know that it gives false positives at a very low rate. Indeed, we did find one false positive case.

[*11] One needs to be careful in the distinction between current "opt out" policies of PICT and our opt out arm. The former contrasts hospital visitors who are offered a test and who are not. In our case, due to ethical reasons, we offer everyone a test, but do so in a differentiated way. What we contrast is employees who are offered a test with taking as the default with employees who are offered a test with not taking as the default. So our "treatment" is the same with PICT but the control is different. And the population will also be different, as hospital visitors have ailments while our sample do not. If the population is the same, we expect smaller impacts in our interventions than under PICT, because our control arm has been provided with stronger recommendations than PICT's control arm. Assuming that the our population has smaller concersn over HIV/AIDS than outpatient visitors at medical facilities, we expect the impacts of the intervention to be even smaller.

that DVD viewing under supportive information can be viewed as a uniform, nondifferentiated way of conveying the information to the subjects while risk assessment by the nurses is a taylor-made, more personalized way.

As a fear can also be an impediment (Lazebnik et al., 2001; Ainslie and Haslam, 1992; Laibson, 1997; Arimoto et al., 2012), we have devised an arm to cope with procrastination of tests under delayed notification. Under this arm, before deciding on test taking, a subject is given an option to defer notification of results up to one week. This, in theory, can eliminate the immediate disutility of knowing the painful truth if infected. We interpreted the prospects or anxiety over this disutility as a fear, and expected its reduction can prompt test taking.

IV.3 Identification strategy

Given that we cannot directly measure both fears and stigma, our estimation strategy does not seek directly to separate their impacts.[*12] So we are testing a joint hypothesises that these arms can reduce fears/stigma and can impact on uptake rates. To be precise, whatever the factors that the each arm brings in, we refer to them as "fear"-reducing or "stigma"-reducing factors, and interpret results as impacts of reduced fears and stigma. What we then estimate are reduced form parameters of fear- and stigma-reducing factors. This joint hypoethsis interpretation is the same with previous research using RCTs (Perry et al., 1991; Simpson et al., 1998; Young et al., 2007; Godlonton and Thornton, 2012; Ngatia, 2011).

We will estimate the impacts by treatment arms and ethnicity. Ethnicity is one of the focal variables in our analysis. This is because stigma and infection are both deeply rooted in social interactions, and ethnicity is a key reference variable among them. When one engages in social interations, we expect such to take place in a network of individuals rather than with a random set of individuals, and its formation is expected to be heavily based on ethnicity. Even if one goes into a bar and has a casual sexual relationship with a random person, we expect it to happen more frequently among the same ethnicity than random ethnicity. As these networks are outcomes of mutual selection, the functioning of each network is also expected to be different by ethnicity. We will therefore interact treatment variables with ethnicity of subjects to see how the responses differ due to differences in peer group acceptance criterion.

If we denote the decision to get tested as a binary variable $D = \{0, 1\}$, then our hypothesises imply:

$$D = \begin{cases} 0 \\ 1 \end{cases} \quad \text{if} \quad D^* = M(I, F, S_t, S_d) \begin{cases} \leqslant \\ > \end{cases} 0,$$

where $I = \{0, 1\}$ is serostatus, F denotes fear, S_t, S_d denotes stigma of testing and HIV/AIDS, respectively. All arguments but serostatus are suggested to reduce the uptake, hence carry negative partial derivatives. Each experimental arms are intended to reduce each arguments.

delayed notification removes immediate psychological costs of fear by differing the notification to the future. Stigma of testing and HIV/AIDS can be different if testing itself carries some psychological and physical costs such as dislike toward plicking, anxiety over talking with nurses or even going into the testing room. Stigma of HIV/AIDS is the worry over alienation, devaluation, petty or

[*12] For analytical convenience, we use the terms "fear" to refer to introspective feeling toward the disease itself apart from any interplay with the society, and "stigma" as anything related to infection that change their relationship with the society, but this is purely for convenience and we do not claim that we have successfully identified separate impacts of them on uptake.

all other forms of different attitudes by others due to the seropositive status. opt out can be intepreted to remove only the stigma of testing, if any, but not the stigma of HIV/AIDS, because it does not address anything about the consequence of test results. supportive information is intended to work on fear, and on the stigma of testing and of HIV/AIDS, as it contains information on the disease and on how one can work and have a life as one could have if treated properly.[*13] For robustness checks, as Simpson et al. (1998) suggest that there are important differences by individual midwives to the extent they can motivate the uptake, or individual midwife effects, we also control for the nurse effects.

In addition to uptake, since we have information on serostatus for the employees who took the test, we can construct a detection binary variable that takes the value of 1 if we observe HIV positive case, i.e., a subject takes a test and finds a seropositive result, 0 otherwise. Detection is of an interest to policy makers who want to know how many HIV positive cases can be found with certain interventions.

Formally, detection is defined with two binary variates, infection I and uptake D. Given that the detection probability is the probability of infection when $D = 1$, and this realizes with a probability $\Pr[D = 1]$. Then detection probability can be written as $\Pr[I = 1|D = 1]\Pr[D = 1]$, or:

$$\Pr[\text{detection}] = \Pr[\text{infection among test takers}]\Pr[\text{uptake}].$$

In other words, detection probit provides no new information beyond uptake probit and infection probits among test takers, but can concisely synthesize the findings in them. Therefore, we will examine uptake and detection in the main text, and we will relegate infection probit estimation to the Appendix. The above relationship shows that the detection probability is dependent on the uptake probability of targeted group, and the infection rate or riskiness among test takers of that group. One achieves greater detection when one successfully targets the risky group and is able to induce them to get tested.

V Results

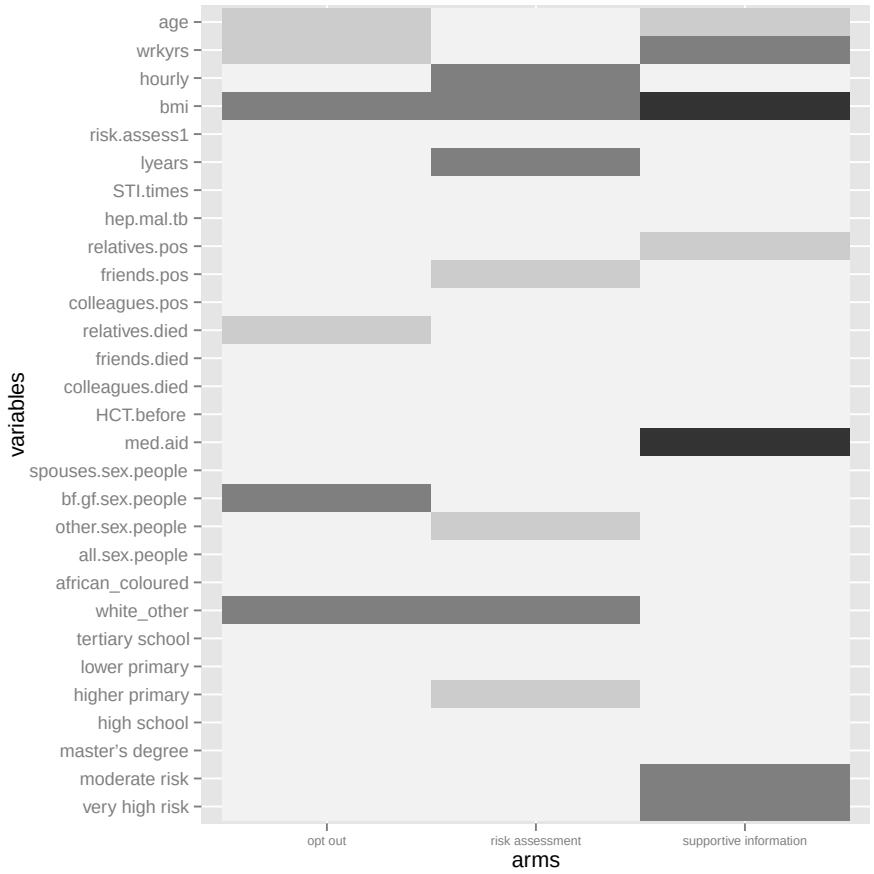
V.1 Balance

We used the control arm in the initial "burn-in" period to train the nurses and receptionists getting used to the intervention protocol, in addition to a week training using mock patients. However, based on the balance checks on the set of variates, we have found unignorable number of employee characteristics that are significantly different between each experimental arms and the control arm. This failure of balancing is possibly due to the fact that our control arm is concentrated at the beginning of the campaign which might have caused to select a particular type of employees. We have thus decided to drop all the control arm observations and use delayed notification arm as the control, because it is spread over the entire period, and there are only 2 people who exercised the option of delayed notification, and all other 711 people disregarded it, hence can be considered as the control.[*14] In Figure 1, we show the balance tests for observable characteristics of employees. While

[*13] Another possible instrument for fears is the change in prognosis, plausibly due to development of new drugs or new treatment methods. An instrument for stigma is increased degree of confidentiality, concealment of symptoms, both of which can result from stricter implementation of privacy protection and changes in scope for clinical suppression of symptoms.

[*14] Strictly speaking, delayed notification is a treatment so it can be different from the control. But if it is different, it is intended to be so in the way it promotes uptake, and the uptake rate should be no smaller than the control. So the bias

FIGURE 1: CONTRASTING CHARACTERISTICS BETWEEN ARMS



Notes: 1. Results of t-tests between the control (=delated notification) and each treatment arms. Grey, dark grey, and black cells indicate statistical significance at 10%, 5%, 1% levels, respectively.

2. Variables are as follows: age (age of subjects), wrkyrs (years at company), hourly (hourly paid worker), bmi (body mass amongdex), risk_assess1 (subjective probability of amongfection), lyears (correct answer to HIV longevity question), "STI_times (number of past STI), hep_mal_tb (amongfected with hepatitis, malaria, tubercrosis), relatives_pos (HIV positive among relatives), friends_pos (HIV positive among friends), colleagues_pos (HIV positive among colleagues), relatives_died (HIV related deaths among relatives), friends_died (HIV related deaths among friends), colleagues_died (HIV related deaths among colleagues), HCT_before (done HCT before), med_aid (have medical insurance), spouses_sex_people (number of spouses with sexual relationship), bf_gf_sex_people (number of boy/girl friends with sexual relationship), other_sex_people (number of other partners with sexual relationship), all_sex_people (total number of people with sexual relationship).

there are some significant differences, most notably in BMI, Whites and others, being medical aid, and number of sex partners in boy friends and girl friends, most of other characteristics are insignificantly different from each other. To account for observable differences, we added these variables as controls in the estimation, most of which turned out to be statistically insignificant.

V.2 Sample

Intervention began in October, 2010 and ended in February, 2011. Total of 3330 people were offered a chance to take HIV tests. Among which, 28 came as a walk-in which we dropped from our analysis. We further dropped 1 observation with missing route (either MSP or HCT), 18 observation with missing ethnicity, 2 observations with missing hivtest. Then we are left with the total of 3281 observations, among which 1771 are from MSP route that are prepared for employees with potential

introduced in the use of delayed notification as control should be underestimation of the impacts of other treatment arms. So our estimates are conservative in this regard with unedrestimation biases.

industrial health hazards. After dropping the entire control arm, 510 observations, we have 2771 observations, of which 1442 are from MSP route.

One concern about the measurement of uptake rates is that there may be individuals who already know their seropositive status and may or may not take tests. This gives a noise to our estimation, and we do not know the direction of the bias it may cause. To make interpretation of estimates straightforward, we drop the suspect cases. Since we could not legally ask the serostatus, we need to use an algorithm to screen out cases who already know their seropositive status (known-to-self seropositive cases). Using information in data set related to serostatus, we can come up with three tiers of criterion: (1) rejects testing by saying that one is already on a treatment (36 observations), (2) rejects testing by saying that one is sure about status and participates in the prevalence study[*15] that results in a positive test result (13 observations), (3) rejects testing by saying that one is sure about status and claims that subjective probability of infection is 100% (51 observations). We regard (1) and (2) to be the most reasonable criterion and use them in our main results. Criteria (3) may include cases who knows their seropositive status, but we suspect it also includes an unignorable number of cases who hesitate to know their serostatus despite their convitions. In the Appendix, we show that estimated results of interventions under criterion (3) do not change qualitativey.[*16]

Applying criteria (1), MSP and HCT sample size are 1412, 1323, respectively, applying (2) gives 1404, 1318, and applying (3) yields 1361, 1310. As stated in the above, we will use for the main analysis the sample with criterion up to (2) with 2722 sample size.

Table A2 gives the descriptive statistics of the 2722 observations that we use in our main analysis. In the descriptive statistics of Table A2, we have 51.6% in MSP and remaining 48.4% in HCT sample. African-Colored are the majority ethnic group with 65.5%, and the White-Other (East Asians) are the smallest group at 10.1%.[*17] Median age is 36, with 40.4% is single, and sample is predominantly male with 80.2%. 54.2% are the hourly paid employees, and median years with the Company is 7. These indicate that the demography of sample to be highly sexually active.

On average, the sample has the median of two affirmative answers to ten STD screening questions that are standardly used in medical practices. The incidence of having PLWHA in relatives, friends, and colleagues are similar to the incidence of HIV/AIDS deaths. With screening out criterion up to (2), the median subjective probability of HIV infection is 0%, with the mean at 16.8%. The same numbers under criteria (1) are 0% and 17.1%, under criterion up to (3) are 0% and 15.1%, respectively.

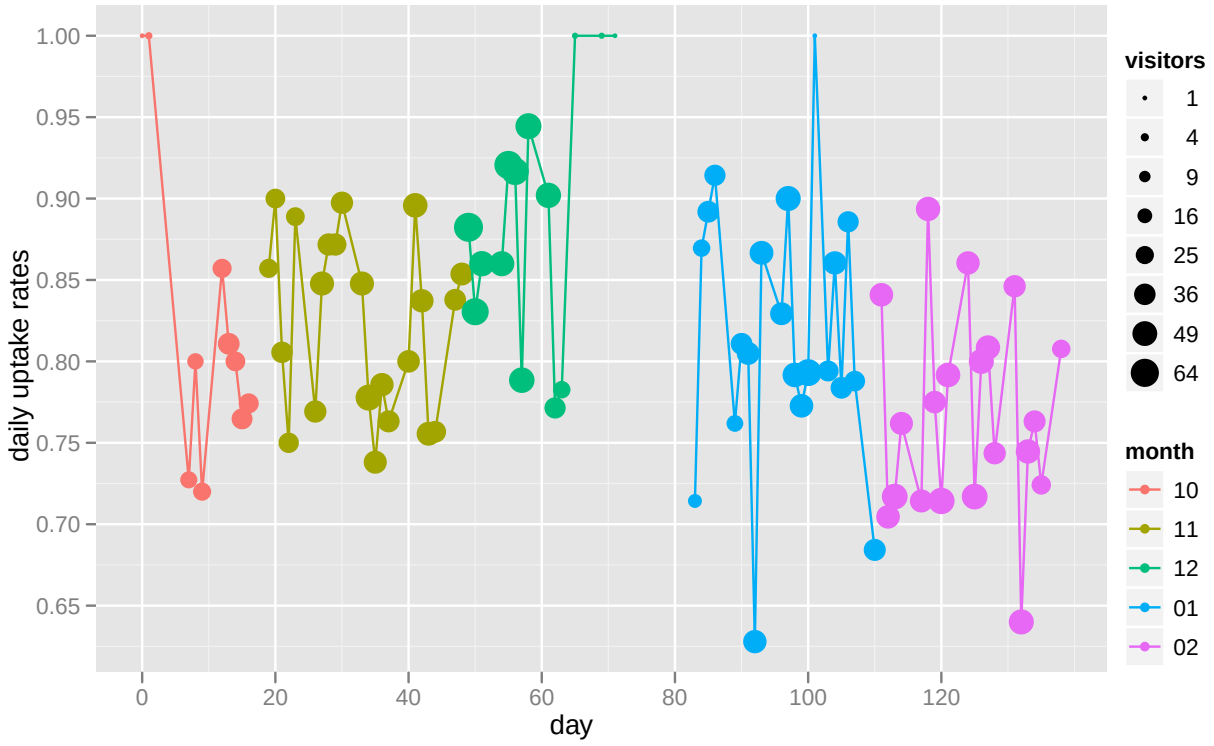
Regarding relationships, 24.2% reports the sexual relationship with multiple partners in the last 12 months, and 6.5% has partner concurrency. South African National AIDS Council (2010, Table 3.15) gives ratio of multiple sexual partnership in the last 12 months among the sampled individuals aged 15-49 that is significantly lower at 10.6% for national average and 10.2% for KwaZulu Natal average. The information on partner concurrency is unique to this data set and there is no comparable information in other data set. Therefore it is difficult to evaluate this number, but we believe the mean ratio of individuals with partner concurrency to be also higher than the KZN average. So we may be looking at potentially riskier population than the rest of KZN, which may be due to having more

[*15] A prevalence study collects anonymous blood sample from individuals and test to estimate population prevalence of the disease.

[*16] In the earlier version of the paper, we show the results do not change if we do not drop suspect cases.

[*17] In MSP, sample size of Colored are 50 while Africans are 671, it is clear that we need to work on increasing the uptake rates among the Africans. As the number of Colored are small and uptake is highly correlated with Africans, we integrate Colored and Africans in estimation to increase efficiency. We have tried separate grouping but wound up having grossly imprecise estimates for the Colored.

FIGURE 2: DAILY UPTAKE RATES AND NUMBER OF VISITORS BY DAY



stable and better paid jobs that would make them more demanded in the dating markets. This is not surprising as the prevalence rates of HIV/AIDS are reportedly higher among the wealthier cohorts in South Africa (Bärnighausen et al., 2007; Gillespie et al., 2007).

V.3 Uptake

As shown in TABLE 3, we targeted 2392 empoyees in HCT and 1860 employees in MSP. Among which, 1519 (63.5% of HCT target) and 1782 (95.8% of MSP target) in MSP individuals participated to the respective medical programs, total of 3301. After dropping observation with missing information, walk-ins, the original control arm, and known-to-self seropositive cases, each sample size is reduced to 1318 and 1404, total of 2722 that we use in our main analysis. Based on these 2722 observations, the number of uptake of HIV test are 1236 (93.8%) and 1017 (72.4%).

Since MSP is compulsory while HCT is not, the compliance rate among HCT sample is lower than MSP sample. This indicates significant self-selection to the company medical program among admistrative workers. Given we could not interview employees who did not comply, we have no way to infer the selection process. The overall uptake rate of 82.8% is considered to be a major improvement from the unofficial estimate of 49% uptake rate of KAPB survey conducted in 2009, before the intervention (Arimoto et al., 2012).[*18] Daily uptake rates in FIGURE 2 vary by date, and follow an inverse-U type curve. This is likely to be induced by the hype toward the World AIDS Day on December 1st and its gradual tapering off afterwards.

The uptake rates do not vary much by arm as shown in TABLE 4. Using a chi-squared test, the null hypothesis that all proportions are equal is not rejected (p value .447). As an overall average treatment on the treated (ATT) estimator without any control covariates, we reject the impacts of

[*18] If we retain the original control in our sample, the uptake rate becomes even higher as the orginal control arm has a higher uptake rate.

Table 3: Sample Selection Process

	hct	msp	total
targeted	2392	1860	4252
complete and complied	1510	1771	3281
(of targeted)	(63.13%)	(95.22%)	(77.16%)
dropped control	1329	1442	2771
(of complete and complied)	(88.01%)	(81.42%)	(84.46%)
non-positive	1318	1404	2722
(of dropped control)	(99.17%)	(97.36%)	(98.23%)
uptake	1236	1017	2253
(of non-positive)	(93.78%)	(72.44%)	(82.77%)
positive	38	58	96
(of uptake)	(3.07%)	(5.70%)	(4.26%)

Notes: 1. "complete and complied" indicates the number of employees whose information in data set is complete for analysis and who have come to the designated testing sites.
2. "dropped control" indicates the number of observations that are left after dropping the original control group due to severe lack of balance with experimental arms.
3. "non-positive" indicates the number of observations that are left after applying the criterion up to (2) that are intended to screen out known-to-self seropositive cases.

Table 4: Uptake by Arms

	yes	no	uptake
control	574	129	0.817
opt out	543	125	0.813
risk assessment	518	98	0.841
supportive information	618	117	0.841
total	2253	469	0.828

Notes: 1. A ratio is a fraction of uptake in total.
2. A null hypothesis that all five ratios to be equal is not rejected with $p = 0.447$ using a χ^2 test. Other tests give similar results.

interventions on uptake, indicating overall ineffectiveness of each experimental arms in comparison to the control arm. This is not surprising because it was found in Arimoto et al. (2012) that fears and stigma are felt by a particular group of individuals, not everyone.

The uptake rates are found to vary by ethnicity, however. In Figure 3, we plot the mean uptake rates by arms and ethnicity, which we classify into African-Colored, Indians, and White-Others.[*19] This shows that Indians are taking tests at above 95% rates under any arm, and Whites and Others are also taking at high rates. African-Colored show the lowest uptake rates under all arms. Although variations between each experimental arms vis-a-vis the control arm are not uniform across ethnicity, we see a general small increase under supportive information over the control. This suggests that we can expect supportive information arm to yield small positive impacts after controlling the observables, and a better fit of estimation if we interact arms with ethnicity.

If we further divide the sample into MSP and HCT, we see that African-Colored in MSP sample have particularly low uptake rates. In Figure 4, we plotted the uptake rates for all arms and ethnicity by route. We see that HCT sample has high uptake rates across all ethnicity and arms, which is consistent with the fact that selection has already taken place at participation to HCT. In MSP sample, Indians and White-Others are recording high rates but African-Colored have substantially lower

[*19] Others are mainly Japanese.

FIGURE 3: UPTAKE RATES BY ETHNICITY AND ARMS

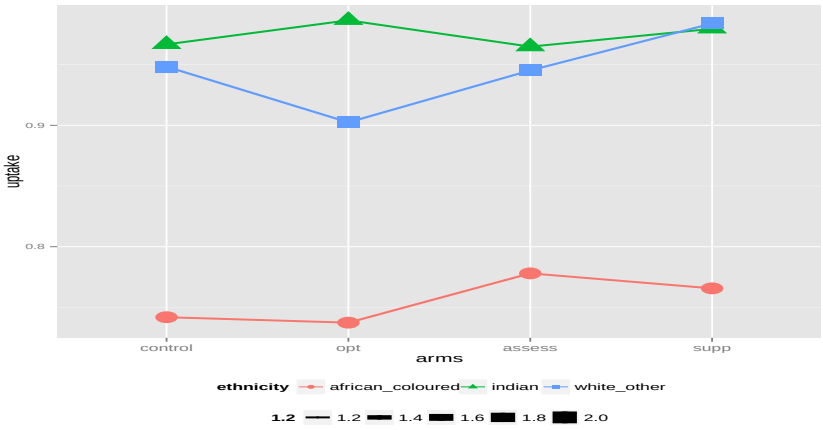
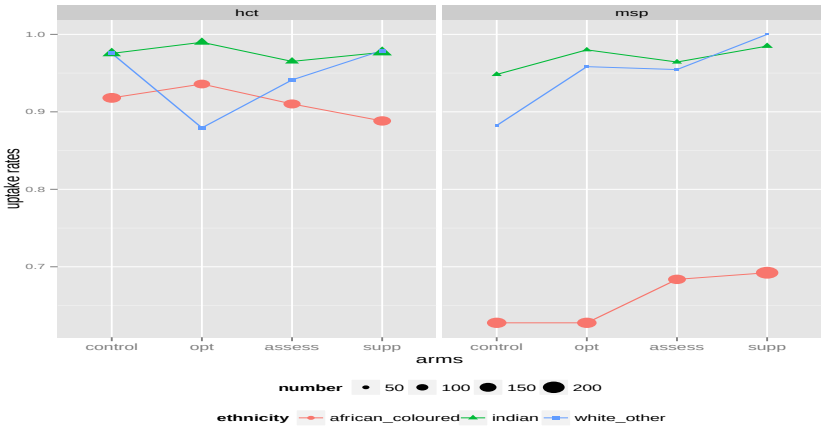


FIGURE 4: UPTAKE RATES BY ETHNICITY, ARMS, AND ROUTE



rates. Indians are in particular showing a stable pattern across arms and routes.[*20] In FIGURE 4, we see a weakly increasing pattern in all the ethnicity of MSP sample, indicating supportive information arm had the largest impacts. We do not observe such a pattern in HCT sample. These observations suggest that we would expect to find impacts of each arms among MSP sample but not in HCT sample.

VI Estimation

In this section, we estimate the uptake probability using probit models. We use as covariates the individual characteristics, work related characteristics, work area dummies, anthropometrics, risk related information, subjective probability and experimental arm dummies. Since the only covariates that are legitimately thought as exogenous are ethnicity, we consider other covariates as controls, and would not try to draw causal interpretations from them. As seen in the previous section, the impacts may vary by ethnicity. Hence we will interact ethnicity with experimental arms. Default category of ethnicity is Indians. All interacted terms are demeaned.

[*20] These are the perfect candidates for the choice of default in creating dummy variables in estimation.

VI.1 Uptake

The results of estimated marginal effects on uptake probabilities are shown in FIGURE 5 for MSP sample and FIGURE 6 for HCT sample. Estimation results on which these figures based are presented in TABLE 5 and TABLE 6. Three panels show arm level estimates, sum of African-Colored level estimates and cross estimates of African-Colored and arms, and sum of White-Others level estimates and cross estimates of White-Others and arms. We compute the sum of level and cross estimates by adding cross marginal effects and ethnicity level marginal effects, or $\beta_{\text{opt out} \times \text{africans / colored}} + \beta_{\text{africans / colored}}$ in the case of cross marginal effects of African-Colored under opt out arm.

As we have seen in the previous section, impact heterogeneity is visible by ethnicity and by route. In FIGURE 5, we confirm our exploratory analysis that supportive information in the MSP sample (arm level estimate with Indians as reference ethnicity) is weakly increasing the uptake rate as evidenced in the bottom left panel. TABLE 5 shows that supportive information has an average impact of pushing up the uptake probability by 6 to 17 percentage points among Indians, depending on the regression specifications. White-Others, in the top right panel, have particularly strong responses to supportive information than their responses under the control arm that their mean (marginal increase in) uptake probability reaches to more than 100% points. They also show positive response to risk assessment that are weakly statistically significant in a few specifications. Thus, in relation to Simpson et al. (1998), White-Others in our sample seemed to have responded more strongly and more uniformly to a nondifferentiated and non-personalized inducement in DVD. This also applies to Indians to a weaker degree. African-Colored show lower uptake rates than Indians by 31 to 46 percentage points. All experimental arms on African-Colored have statistically insignificant marginal cross effects, hence the impacts of each arms on African-Colored are similar to those on Indians. Therefore we expect supportive information to be effective on African-Colored.

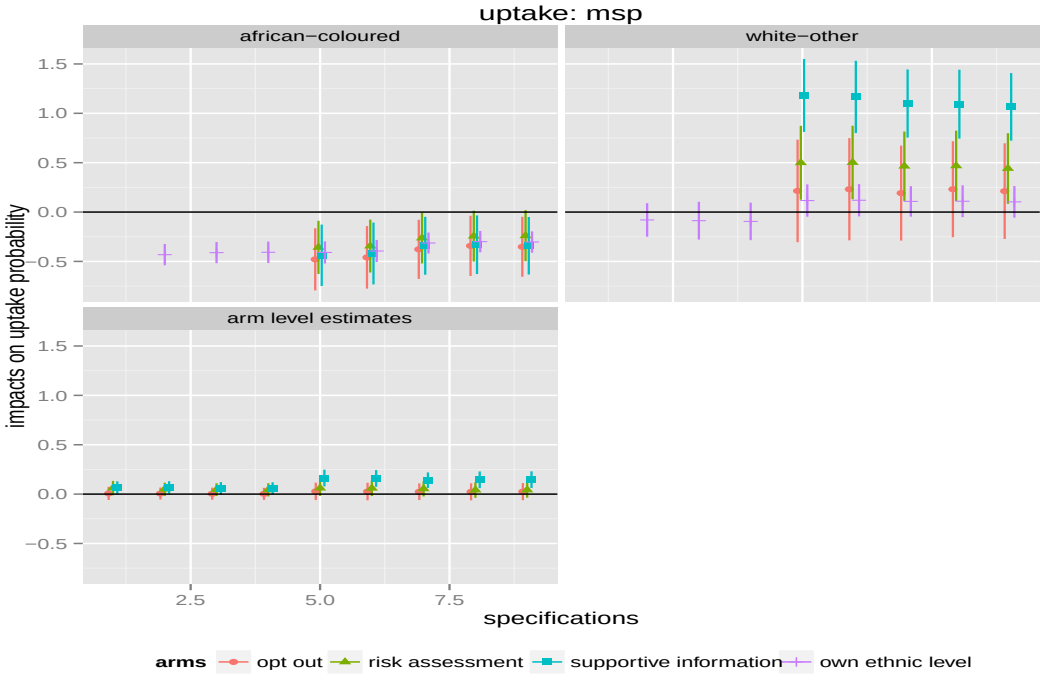
For the HCT sample in FIGURE 6, we observe that each arm has almost no marginal effects in their levels with Indians as the reference ethnicity. As also shown in TABLE 6, level effects of African-Colored are negative and statistically significant in all specifications, while cross effects with arms are no different from ethnicity level effects, indicating that experimental arms did not give any impacts on increasing the uptake among them. Their relative uptake probabilities in ethnicity levels are smaller than the default ethnicity of Indians by 7 to 11 percentage points. This compares favorably with MSP sample whose ethnicity level estimates of African-Colored are smaller by 30 to 43 percentage points. The difference of ethnicity impacts between MSP and HCT samples may be due to the fact that HCT sample comprises of administrative employees who are more educated about HIV/AIDS, and also that HCT is a self-selected sample who are more willing to take tests. White-Others show their relative uptake probabilities to be smaller than Indians, but only those of opt out arm are statistically significant.

In sum, joint hypothesises that our experimental arm can reduce fears and stigma, consequently can increase uptake, are rejected for opt out, risk assessment at levels. supportive information impacts at levels are found to be robustly statistically significant by the margin of 6 to 16% points. This gives a clue that the stigma of HIV/AIDS may be behind the low uptake.[*21]

While this is encouraging, the magnitudue of its positive impacts are much smaller than the magni-

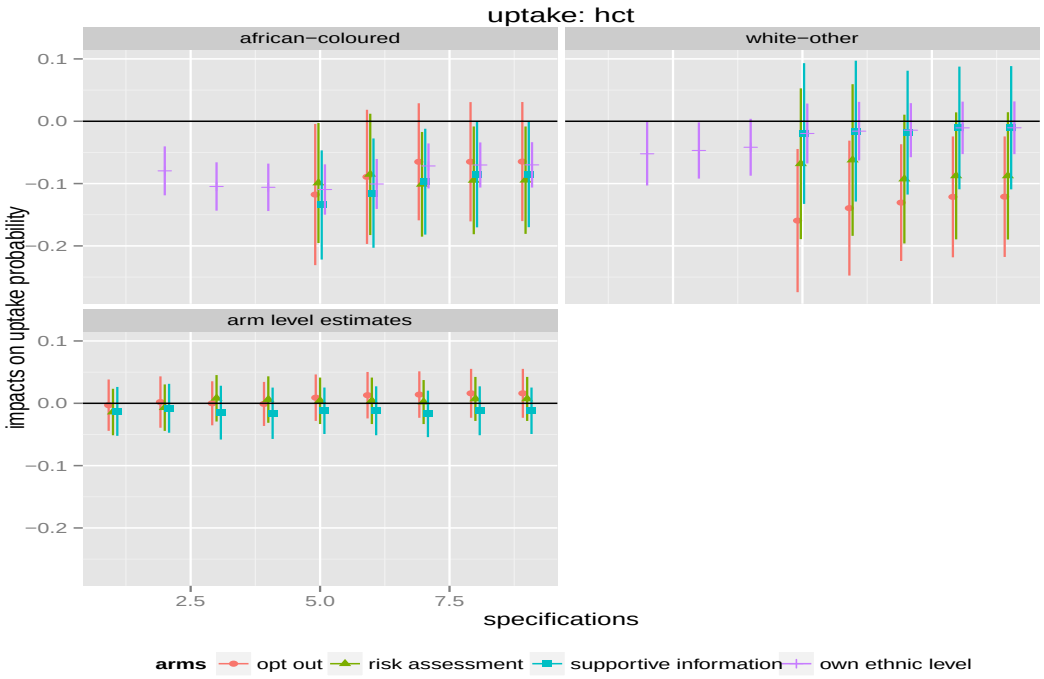
[*21] Delayed notification arm that is intended to reduce fears is not effective as there are only two subjects who exercised the delay option, hence the joint hypothesis of procrastination and fear as impediments should be considered as being rejected. Thus fears may be considered as the reasons for test rejection, but not procrastination.

FIGURE 5: CROSS MARGINAL IMPACTS OF EACH ARMS AND ETHNICITY, MSP SAMPLE



Notes
1. Estimates are from TABLE 5. Vertical axis represents estimated marginal change in uptake probability, horizontal axis gives the regression specifications, (1) to (9). Points give the point estimates under each regression specifications of respective arms, and bars indicate 95% confidence intervals.
2. Cluster robust standard errors are used. Clusters are area × date.
3. Under each experimental arms, estimates are computed by adding a level estimate with a cross estimate, for example for African-Colored under opt out arm, by $\beta_{\text{opt out} \times \text{africans / colored}} + \beta_{\text{africans / colored}}$. For the control arm, level estimates of ethnicity impacts, say, $\beta_{\text{africans / colored}}$, are presented. All interaction terms are demeaned.
4. Estimates of marginal impacts on uptake probabilities are computed by taking the average of probabilities $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}' \mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
5. Default (omitted) ethnicity category is Indians.
6. MSP sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

FIGURE 6: CROSS MARGINAL IMPACTS OF EACH ARMS AND ETHNICITY, HCT SAMPLE



Notes: Estimates are from TABLE 6. See footnotes of FIGURE 5.

Table 5: Uptake Probit, MSP Sample, Marginal Effects

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	0.167***	1.286***	1.369***	1.362***	1.323***	1.458***	1.278***	1.343***	1.326***
	(0.026)	(0.188)	(0.206)	(0.212)	(0.213)	(0.235)	(0.233)	(0.311)	(0.309)
arm (optout)	0.007	0.006	0.004	0.003	0.028	0.026	0.024	0.023	0.025
	(0.034)	(0.031)	(0.031)	(0.031)	(0.045)	(0.045)	(0.043)	(0.044)	(0.044)
arm (assess)	0.061*	0.049	0.045	0.043	0.060	0.059	0.053	0.041	0.042
	(0.037)	(0.034)	(0.033)	(0.034)	(0.040)	(0.040)	(0.039)	(0.040)	(0.040)
arm (supp)	0.063*	0.068**	0.059*	0.057*	0.163***	0.159***	0.141***	0.145***	0.146***
	(0.034)	(0.032)	(0.032)	(0.032)	(0.043)	(0.043)	(0.040)	(0.043)	(0.043)
african / colored		−0.432***	−0.411***	−0.407***	−0.409***	−0.394***	−0.314***	−0.300***	−0.303***
		(0.055)	(0.055)	(0.055)	(0.057)	(0.057)	(0.054)	(0.055)	(0.055)
white / other		−0.080	−0.087	−0.095	0.117	0.119	0.108	0.110	0.103
		(0.087)	(0.098)	(0.097)	(0.083)	(0.083)	(0.079)	(0.082)	(0.082)
age / 10		−0.391***	−0.405***	−0.393***	−0.391***	−0.417***	−0.331***	−0.347***	−0.349***
		(0.093)	(0.098)	(0.098)	(0.098)	(0.107)	(0.107)	(0.107)	(0.105)
(age / 10)^2		0.050***	0.051***	0.050***	0.050***	0.052***	0.042***	0.042***	0.042***
		(0.011)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)
BMI / 10		−0.036*	−0.031*	−0.031*	−0.033*	−0.035*	−0.040**	−0.041**	−0.041**
		(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.018)	(0.018)	(0.018)
number of bf gf		−0.020	−0.019	−0.019	−0.019	−0.005	0.002	−0.002	−0.002
		(0.013)	(0.013)	(0.013)	(0.013)	(0.020)	(0.019)	(0.019)	(0.019)
higher primary				−0.003	−0.003	−0.008	−0.014	−0.012	−0.015
				(0.033)	(0.034)	(0.034)	(0.035)	(0.035)	(0.035)
high school				0.016	0.018	0.011	0.003	−0.020	−0.026
				(0.038)	(0.039)	(0.038)	(0.039)	(0.040)	(0.041)
tertiary education				0.023	0.031	0.013	0.005	−0.063	−0.047
				(0.206)	(0.201)	(0.211)	(0.218)	(0.239)	(0.253)
arm (optout) * african / coloured					−0.070	−0.065	−0.064	−0.043	−0.048
					(0.154)	(0.154)	(0.147)	(0.151)	(0.151)
arm (optout) * white / other					0.097	0.112	0.084	0.122	0.109
					(0.252)	(0.251)	(0.236)	(0.240)	(0.240)
arm (assess) * african / coloured					0.052	0.050	0.050	0.056	0.064
					(0.138)	(0.137)	(0.132)	(0.134)	(0.135)
arm (assess) * white / other					0.383*	0.382**	0.357*	0.358*	0.338*
					(0.196)	(0.195)	(0.185)	(0.191)	(0.191)
arm (supp) * african / coloured					−0.028	−0.025	−0.028	−0.031	−0.038
					(0.151)	(0.151)	(0.143)	(0.146)	(0.145)
arm (supp) * white / other					1.065***	1.047***	0.992***	0.983***	0.962***
					(0.199)	(0.197)	(0.188)	(0.194)	(0.192)
multiple partners						−0.007	0.001	−0.001	0.004
						(0.037)	(0.037)	(0.036)	(0.036)
other partners						0.064	0.048	0.041	0.038
						(0.047)	(0.047)	(0.046)	(0.046)
single						−0.058*	−0.044	−0.037	−0.037
						(0.034)	(0.033)	(0.034)	(0.034)
STD times						−0.008	−0.005	−0.005	−0.003
						(0.013)	(0.016)	(0.016)	(0.016)
STI screen						−0.012	−0.002	−0.000	0.001
						(0.015)	(0.016)	(0.016)	(0.016)
TB screen						−0.008	−0.005	−0.004	−0.005
						(0.008)	(0.008)	(0.008)	(0.008)
subjective probability							−0.253***	−0.257***	−0.257***
							(0.045)	(0.045)	(0.045)
days since HCT began / 100								0.085	0.055
								(0.346)	(0.347)
(days since HCT began / 100)^2								−0.074	−0.060
								(0.147)	(0.147)
hourly paid workers								−0.043	−0.037
								(0.031)	(0.031)
years at Company								0.001	0.001
								(0.002)	(0.002)
HCT before									0.050*
									(0.026)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.004	0.112	0.131	0.132	0.134	0.14	0.163	0.168	0.171
n	1404	1387	1387	1382	1382	1377	1294	1274	1274

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. MSP sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

Table 6: Uptake Probit, HCT Sample, Marginal Effects

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	0.196***	0.599***	0.559***	0.561***	0.577***	0.623***	0.567***	0.649***	0.648***
	(0.022)	(0.147)	(0.148)	(0.143)	(0.148)	(0.155)	(0.148)	(0.228)	(0.229)
arm (optout)	−0.003	0.002	−0.000	−0.001	0.009	0.013	0.014	0.016	0.016
	(0.021)	(0.021)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)
arm (assess)	−0.014	−0.007	0.008	0.006	0.004	0.004	0.002	0.007	0.007
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.018)	(0.018)	(0.018)
arm (supp)	−0.013	−0.008	−0.015	−0.016	−0.012	−0.012	−0.017	−0.012	−0.012
	(0.020)	(0.020)	(0.022)	(0.021)	(0.019)	(0.020)	(0.019)	(0.020)	(0.019)
african / colored		−0.080***	−0.105***	−0.106***	−0.110***	−0.101***	−0.072***	−0.070***	−0.070***
		(0.020)	(0.020)	(0.019)	(0.021)	(0.020)	(0.018)	(0.018)	(0.019)
white / other		−0.052**	−0.047**	−0.042*	−0.020	−0.016	−0.014	−0.011	−0.010
		(0.026)	(0.023)	(0.023)	(0.024)	(0.024)	(0.022)	(0.021)	(0.022)
age / 10		−0.190***	−0.169**	−0.160**	−0.170**	−0.186**	−0.171**	−0.168**	−0.167**
		(0.073)	(0.076)	(0.075)	(0.080)	(0.083)	(0.079)	(0.082)	(0.083)
(age / 10)^2		0.024**	0.021**	0.020**	0.021**	0.022**	0.020*	0.019*	0.019*
		(0.010)	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
BMI / 10		−0.015	−0.010	−0.010	−0.009	−0.007	0.000	0.001	0.001
		(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
number of bf gf		0.007	0.001	0.001	0.002	0.003	0.007	0.004	0.004
		(0.006)	(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.007)	(0.007)
higher primary				−0.040	−0.037	−0.033	−0.025	−0.027	−0.027
				(0.035)	(0.034)	(0.033)	(0.031)	(0.034)	(0.034)
high school				−0.001	0.000	−0.002	0.003	0.002	0.002
				(0.037)	(0.036)	(0.034)	(0.032)	(0.036)	(0.036)
tertiary education				−0.006	0.001	0.002	0.005	0.004	0.004
				(0.042)	(0.041)	(0.038)	(0.036)	(0.040)	(0.040)
master's degree				−0.082	−0.074	−0.081	−0.079	−0.079	−0.079
				(0.055)	(0.053)	(0.052)	(0.049)	(0.051)	(0.051)
arm (optout) * african / coloured					−0.008	0.011	0.007	0.005	0.005
					(0.055)	(0.053)	(0.047)	(0.047)	(0.048)
arm (optout) * white / other					−0.140**	−0.123**	−0.116**	−0.111**	−0.111**
					(0.062)	(0.060)	(0.054)	(0.056)	(0.056)
arm (assess) * african / coloured					0.010	0.015	−0.029	−0.025	−0.025
					(0.048)	(0.047)	(0.042)	(0.043)	(0.044)
arm (assess) * white / other					−0.049	−0.046	−0.078	−0.077	−0.077
					(0.064)	(0.064)	(0.056)	(0.055)	(0.056)
arm (supp) * african / coloured					−0.025	−0.015	−0.025	−0.015	−0.015
					(0.046)	(0.046)	(0.043)	(0.044)	(0.044)
arm (supp) * white / other					−0.000	0.000	−0.004	−0.000	0.000
					(0.062)	(0.063)	(0.057)	(0.058)	(0.058)
multiple partners						0.037	0.028	0.034	0.033
						(0.023)	(0.028)	(0.026)	(0.026)
other partners						−0.013	−0.007	−0.013	−0.013
						(0.030)	(0.030)	(0.030)	(0.030)
single						−0.036**	−0.027*	−0.023	−0.023
						(0.016)	(0.016)	(0.016)	(0.016)
STD times						−0.012**	−0.006	−0.006	−0.006
						(0.005)	(0.004)	(0.004)	(0.004)
STI screen						−0.001	−0.001	−0.002	−0.002
						(0.007)	(0.008)	(0.008)	(0.008)
TB screen						−0.007	−0.004	−0.003	−0.003
						(0.005)	(0.005)	(0.005)	(0.005)
subjective probability							−0.141***	−0.142***	−0.142***
							(0.026)	(0.025)	(0.025)
days since HCT began / 100								−0.276	−0.275
								(0.313)	(0.310)
(days since HCT began / 100)^2								0.138	0.137
								(0.134)	(0.133)
hourly paid workers								0.003	0.002
								(0.021)	(0.021)
years at Company								0.001	0.001
								(0.001)	(0.001)
HCT before									−0.002
									(0.016)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.001	0.067	0.176	0.191	0.207	0.231	0.308	0.313	0.313
n	1318	1315	1315	1310	1310	1308	1248	1233	1233

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **, *** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. HCT sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

tude of impacts of ethinicity level for africans/corloured. African-Colored show consistently lower uptake rates than Indians under any arm, and no experimental arm can counter this. All arms have no significant cross-ethnicity impacts on increasing the uptake except for White-Others under supportive information and risk assessments in MSP sample. In HCT sample, no arm has statistically siginificant impacts in levels, due possibly to the fact that HCT is self-selected sample, while oput out has strong negative impacts on White-Others.

As HCT sample is more of white collar and MSP sample is blue collar, we expect the educational attainment, household background, and work style differ significantly between these groups of Africans-Coloured. In fact, when lower primary or less accounts for 21% and high school accounts for 25% in African-Colored MSP sample, these are 8% and 39%, respectively, for African-Colored HCT sample. Even after controlling for differences in educational achievements, African-Colored in MSP and HCT samples show the lower uptake rates relative to Indians, albeit less so for HCT sample. This leads us to a conjecture that the an important portion of test rejection by African-Colored may be rooted in their ethnic institutions outside the formal institutions, not education nor job types.

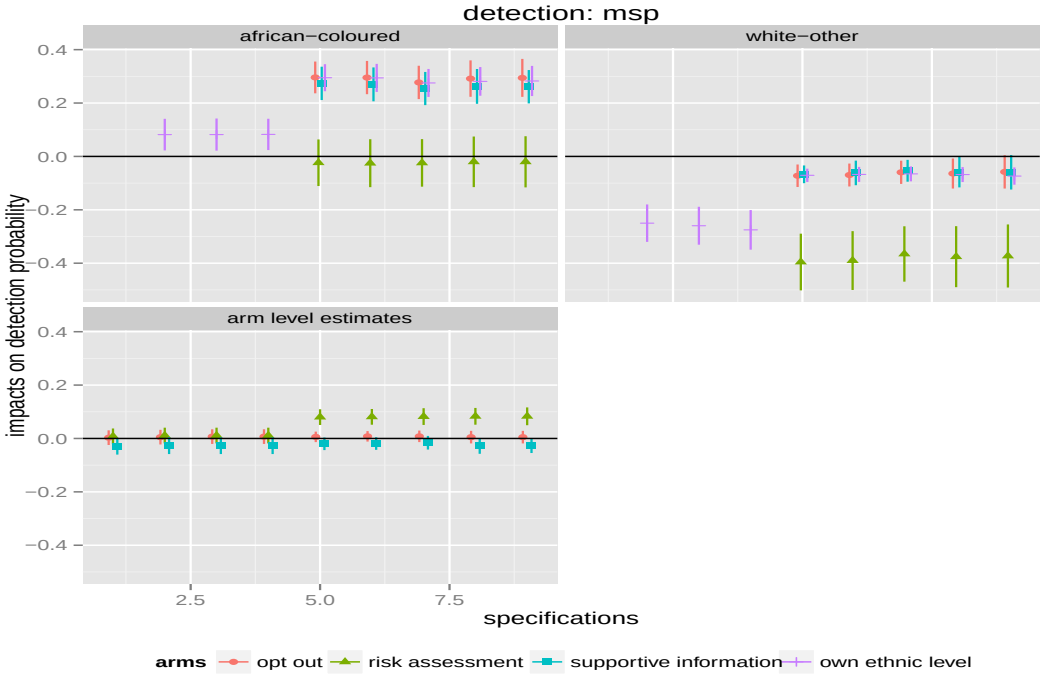
Estimates on subjective probability are robustly negative on the uptake in both MSP and HCT samples. Point estimates show that a 10% increase in subjective probability is associated with a 2.5% reduction in uptake rates in MSP, resulting in elasticity of .25, while this number is more than halved in HCT sample. Note that variates that can be associated with riskiness such as single and STD times are negative and statistically significant in the specification (6) of HCT sample, or single is negative and statistically marginally significant in the specification (6) of MSP sample, they become insignificant once we use subjective probability. This implies that subjective probability has more direct and stronger association with unobservable riskiness than other variates. It also gives an indication that usual STI screening questions and other risk behavioral questions may not fully capture the unobservable risky conducts taken by the subjects. Estimates on age are negative, as expected, because older employees may feel less in need for HIV testing. Negative estimates on BMI in MSP sample show that more obese individuals tend to reject the tests. This may be a reflection of general indifference toward health and/or general lack of HIV contraction risks in more obese individuals.

VI.2 Detection

In Figure 7 and Figure 8, we plot the estimates and their 95% confidence intervals on detection based on Table 7 and Table 8. As can be seen, African-Colored group is more at-risk and shows positive estimates on detection. Although their uptake is lower than the others, their greater riskiness or infection probability more than compensates for the smaller uptake probability. So one could have achieved higher detection had we been able to induce African-Colored to get tested at a higher rate.

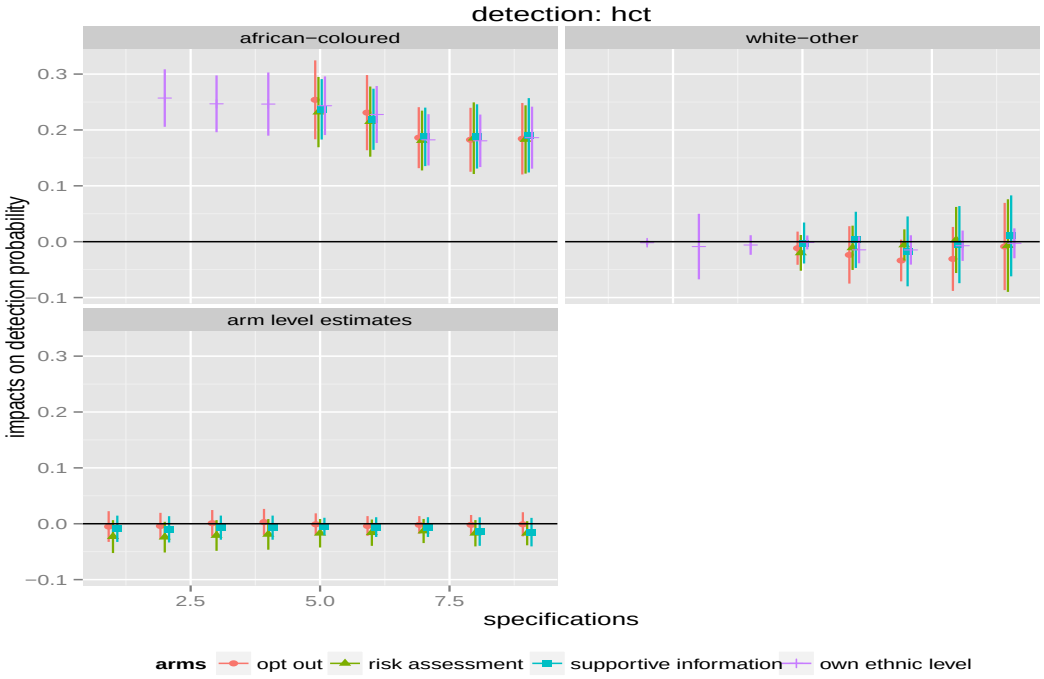
What is noteworthy about Figure 8 is that African-Colored among HCT sample has higher detection probabilities by 17 to 25 percentage points. While some of these numbers are smaller than their MSP counterparts which range between 8 and 29 percentage points, they are large nonetheless if we consider the educational attainment among HCT sample is higher than MSP sample. In Table 7 and Table 8, we see that having finished tertiary education is strongly related to the reduction in detection. Recalling that uptake is not negative for tertiary degree holders, this is likely to be due to safer conducts taken by this group. The protection against the disease that the school education buys is negligible up to matriculation holders among African-Colored, suggesting their ethnic background is still important among administrative workers with relatively higher educational attainment.

FIGURE 7: CROSS MARGINAL IMPACTS OF EACH ARMS AND ETHNICITY ON HIV DETECTION, MSP SAMPLE



Notes 1. Estimates are from TABLE 7. Vertical axis represents estimated marginal change in uptake probability, horizontal axis gives the regression specifications, (1) to (9). Points give the point estimates under each regression specifications of respective arms, and bars indicate 95% confidence intervals.
2. Detection binary variable takes the value of 1 if we observe HIV positive case, i.e., a subject takes a test and shows a seropositive result, 0 otherwise.
3. See footnotes of FIGURE 5.

FIGURE 8: CROSS MARGINAL IMPACTS OF EACH ARMS AND ETHNICITY ON HIV DETECTION, HCT SAMPLE



Notes: Estimates are from TABLE 8. See footnotes of FIGURE 7.

TABLE 7: DETECTION PROBIT, MSP SAMPLE, MARGINAL EFFECTS

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	−0.148***	−0.352***	−0.363***	−0.366***	−0.592***	−0.562***	−0.847***	−0.972***	−0.969***
	(0.010)	(0.107)	(0.111)	(0.113)	(0.123)	(0.130)	(0.142)	(0.180)	(0.183)
arm (optout)	0.003	0.005	0.007	0.007	0.006	0.008	0.008	0.005	0.005
	(0.014)	(0.014)	(0.014)	(0.014)	(0.010)	(0.010)	(0.011)	(0.012)	(0.012)
arm (assess)	0.008	0.011	0.011	0.011	0.080***	0.081***	0.082***	0.083***	0.083***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.017)
arm (supp)	−0.029*	−0.027	−0.027*	−0.027*	−0.020*	−0.019	−0.016	−0.028*	−0.027*
	(0.016)	(0.016)	(0.016)	(0.016)	(0.012)	(0.012)	(0.013)	(0.015)	(0.014)
african / colored		0.082***	0.082***	0.082***	0.295***	0.294***	0.275***	0.281***	0.283***
		(0.030)	(0.031)	(0.030)	(0.026)	(0.027)	(0.027)	(0.027)	(0.029)
white / other		−0.250***	−0.260***	−0.275***	−0.071***	−0.067***	−0.065***	−0.068***	−0.074***
		(0.036)	(0.036)	(0.038)	(0.013)	(0.014)	(0.014)	(0.014)	(0.016)
age / 10		0.063	0.058	0.056	0.056	0.037	0.016	0.012	0.010
		(0.054)	(0.054)	(0.056)	(0.057)	(0.061)	(0.062)	(0.064)	(0.065)
(age / 10)^2		−0.007	−0.007	−0.007	−0.007	−0.004	−0.002	−0.002	−0.002
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
BMI / 10		−0.002	−0.002	−0.003	−0.002	−0.002	−0.006	−0.006	−0.006
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)
number of bf gf		0.011**	0.010**	0.010**	0.010*	0.012*	0.015**	0.015**	0.015**
		(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
higher primary				0.005	0.004	0.005	−0.001	0.000	−0.001
				(0.017)	(0.017)	(0.018)	(0.019)	(0.020)	(0.020)
high school				0.004	0.003	0.004	−0.003	−0.004	−0.002
				(0.020)	(0.020)	(0.020)	(0.021)	(0.022)	(0.023)
tertiary education				−0.328***	−0.343***	−0.346***	−0.328***	−0.349***	−0.344***
				(0.041)	(0.042)	(0.042)	(0.043)	(0.045)	(0.045)
arm (optout) * african / coloured					0.001	0.001	0.002	0.010	0.012
					(0.016)	(0.017)	(0.017)	(0.019)	(0.020)
arm (optout) * white / other					−0.002	−0.002	0.006	0.004	0.016
					(0.017)	(0.020)	(0.022)	(0.026)	(0.029)
arm (assess) * african / coloured					−0.319***	−0.320***	−0.300***	−0.301***	−0.303***
					(0.045)	(0.046)	(0.046)	(0.048)	(0.048)
arm (assess) * white / other					−0.325***	−0.323***	−0.300***	−0.308***	−0.299***
					(0.047)	(0.049)	(0.045)	(0.050)	(0.053)
arm (supp) * african / coloured					−0.021	−0.024	−0.021	−0.019	−0.022
					(0.019)	(0.019)	(0.019)	(0.020)	(0.018)
arm (supp) * white / other					0.004	0.006	0.012	0.010	0.014
					(0.021)	(0.025)	(0.021)	(0.029)	(0.032)
multiple partners						−0.007	−0.023	−0.024	−0.026
						(0.018)	(0.018)	(0.018)	(0.018)
other partners						0.003	0.011	0.013	0.014
						(0.020)	(0.020)	(0.020)	(0.020)
single						−0.017	−0.020	−0.017	−0.016
						(0.018)	(0.018)	(0.018)	(0.018)
STD times						0.003	−0.002	−0.002	−0.002
						(0.003)	(0.004)	(0.004)	(0.004)
STI screen						0.007	0.006	0.006	0.005
						(0.005)	(0.005)	(0.005)	(0.005)
TB screen						0.001	0.002	0.002	0.002
						(0.003)	(0.004)	(0.004)	(0.004)
subjective probability							0.066***	0.066***	0.069***
							(0.019)	(0.019)	(0.019)
days since HCT began / 100								0.251	0.273*
								(0.164)	(0.162)
(days since HCT began / 100)^2								−0.102	−0.113
								(0.069)	(0.069)
hourly paid workers								−0.008	−0.010
								(0.012)	(0.012)
years at Company								0.001	0.001
								(0.001)	(0.001)
HCT before									−0.022*
									(0.013)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.013	0.074	0.1	0.101	0.106	0.115	0.152	0.16	0.167
n	1404	1387	1387	1382	1382	1377	1294	1274	1274

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. MSP sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

Table 8: Detection Probit, HCT Sample, Marginal Effects

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	−0.116***	−0.510***	−0.467***	−0.450***	−0.447***	−0.463***	−0.343***	−0.421***	−0.437***
	(0.008)	(0.082)	(0.091)	(0.093)	(0.093)	(0.100)	(0.090)	(0.152)	(0.158)
arm (optout)	−0.005	−0.004	0.001	0.003	−0.001	−0.004	−0.002	−0.002	−0.001
	(0.014)	(0.012)	(0.012)	(0.012)	(0.010)	(0.009)	(0.008)	(0.009)	(0.011)
arm (assess)	−0.023	−0.024*	−0.021	−0.019	−0.017	−0.016	−0.013	−0.017	−0.017
	(0.015)	(0.014)	(0.014)	(0.014)	(0.013)	(0.012)	(0.011)	(0.012)	(0.011)
arm (supp)	−0.009	−0.010	−0.007	−0.007	−0.005	−0.006	−0.006	−0.014	−0.015
	(0.012)	(0.012)	(0.011)	(0.011)	(0.008)	(0.009)	(0.009)	(0.013)	(0.013)
african / colored		0.257***	0.247***	0.246***	0.243***	0.228***	0.182***	0.181***	0.186***
		(0.026)	(0.026)	(0.029)	(0.027)	(0.026)	(0.023)	(0.024)	(0.028)
white / other		−0.002	−0.009	−0.006	−0.001	−0.015	−0.015	−0.007	−0.003
		(0.002)	(0.030)	(0.009)	(0.006)	(0.012)	(0.013)	(0.014)	(0.014)
age / 10		0.081**	0.073*	0.065	0.065	0.071	0.025	0.013	0.021
		(0.037)	(0.041)	(0.042)	(0.042)	(0.047)	(0.044)	(0.044)	(0.044)
(age / 10)^2		−0.009*	−0.008	−0.007	−0.007	−0.007	−0.002	0.000	−0.001
		(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
BMI / 10		−0.002	−0.004	−0.004	−0.004	−0.007	−0.003	−0.002	−0.003
		(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)
number of bf gf		0.005	0.003	0.002	0.002	−0.003	−0.005	−0.004	−0.004
		(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.007)
higher primary				0.009	0.009	0.011	0.001	0.004	0.008
				(0.017)	(0.017)	(0.017)	(0.017)	(0.018)	(0.016)
high school				−0.015	−0.015	−0.012	−0.022	−0.017	−0.012
				(0.019)	(0.020)	(0.020)	(0.020)	(0.022)	(0.021)
tertiary education				−0.218***	−0.218***	−0.201***	−0.180***	−0.182***	−0.192***
				(0.028)	(0.028)	(0.028)	(0.037)	(0.039)	(0.040)
master's degree				0.001	0.001	0.008	0.013	0.016	0.025
				(0.024)	(0.024)	(0.024)	(0.020)	(0.024)	(0.024)
arm (optout) * african / coloured					0.011	0.003	0.004	0.002	−0.002
					(0.021)	(0.020)	(0.016)	(0.023)	(0.029)
arm (optout) * white / other					−0.010	−0.009	−0.019	−0.024	−0.006
					(0.016)	(0.024)	(0.018)	(0.025)	(0.040)
arm (assess) * african / coloured					−0.011	−0.013	−0.001	0.005	−0.003
					(0.021)	(0.022)	(0.016)	(0.025)	(0.028)
arm (assess) * white / other					−0.019	0.004	0.009	0.010	−0.004
					(0.017)	(0.026)	(0.019)	(0.028)	(0.044)
arm (supp) * african / coloured					−0.006	−0.009	0.005	0.008	0.004
					(0.015)	(0.015)	(0.014)	(0.023)	(0.031)
arm (supp) * white / other					−0.001	0.018	−0.003	0.002	0.013
					(0.018)	(0.027)	(0.031)	(0.031)	(0.039)
multiple partners						0.002	0.003	0.001	−0.001
						(0.012)	(0.012)	(0.012)	(0.012)
other partners						−0.053**	−0.045**	−0.045**	−0.052***
						(0.021)	(0.018)	(0.018)	(0.020)
single						0.027**	0.019*	0.016	0.012
						(0.011)	(0.011)	(0.011)	(0.011)
STD times						0.008**	0.004	0.003	0.003
						(0.004)	(0.003)	(0.004)	(0.004)
STI screen						0.003	0.004	0.004	0.004
						(0.004)	(0.003)	(0.003)	(0.003)
TB screen						−0.001	−0.004	−0.004	−0.003
						(0.003)	(0.003)	(0.003)	(0.003)
subjective probability							0.063***	0.064***	0.065***
							(0.017)	(0.017)	(0.017)
days since HCT began / 100								0.167	0.198
								(0.167)	(0.172)
(days since HCT began / 100)^2								−0.071	−0.083
								(0.069)	(0.071)
hourly paid workers								0.019	0.019
								(0.014)	(0.014)
years at Company								−0.001	−0.001
								(0.001)	(0.001)
HCT before									−0.029**
									(0.011)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.009	0.191	0.241	0.257	0.257	0.295	0.349	0.36	0.386
n	1318	1315	1315	1310	1310	1308	1248	1233	1233

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **, *** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. HCT sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

The fact that ethnicity, education and age are readily observable, one can identify more at-risk group by the observable characteristics. Furthermore, if one can induce them to take the tests, we can expect a substantial number of newly found HIV positive cases. We also find that number of boy friends and girl friends to be positively correlated with detection among MSP sample, even after adding subjective probability and multiple partners to the covariates. This reconfirms the general wisdom that having more number of sex partners is correlated with the risk of infection.

One also notes that, in FIGURE 7, detection estimates of risk assessment for MSP sample are lower than other arms for African-Colored and White-Others. One should recall that, in FIGURE 5, risk assessment for MSP sample is no less successful than other arms in inducing uptake. Then, smaller estimates in detection reveal that nurses under risk assessment may have been trying too hard to get the safer subjects to get tested with African-Colored and White-Others groups, or have been ineffective in inducing high risk subjects to get tested. As arm level estimates in TABLE 7 are positive and significant, the overall impacts of risk assessment were positive in detection, but, at the margin of African-Colored and White-Others groups, it is safer subjects who have tested more and consequently lowered the rate of detecting the HIV positive cases among them. This is in line with Simpson et al. (1998)'s results that confirmed heterogeneity in midwives in the extent of motivating the individuals to get tested. At the same time, this also indicates that greater efforts by the good-intentioned nurses can sometimes be counterproductive, as the marginal returns in detection of their efforts are negative and could not induce the uptake of riskier subjects. This is observed only in MSP sample and not in HCT sample. We see negative cross estimates between opt out and White-Others in HCT sample, which is a natural outcome of smaller uptake rates in this arm-ethnicity.

VI.3 Robustness checks

We used exclusion criterion up to (3) in TABLE A3, TABLE A4 for uptake, TABLE A5, TABLE A6 for detection. The point estimates do not differ much in all tables, and qualitative results remain the same. In FIGURE A1, we plotted coefficient of variation in uptake against number of subjects each nurse faced. The curve does not seem ot show a meaningful pattern, yet, if we exclude the right most point, it seems to indicate that uptake decision becomes more uniform once a nurse faces more than 200 subjects. So we also used nurse fixed effects to account for different ability by nurses. Since nurses are stationed in the fixed points of care, we replaced area fixed effects with nurse fixed effects as they are perfectly collinear. Results are shown in TABLE A9 and TABLE A10. Again, results are similar with these in the main text. For completeness sake, we also estimated infection among the test takers, whose results are given in TABLE A7 and TABLE A8.

VII Conclusions

We have run experimental interventions in a large firm in South Africa. We combined HIV tests with existing medical check up programs to increase the uptake. Uptake rate increased dramatically, not only under experimental arms but also under the control arm. By ethnicity, Africans and Colored are the groups that reject tests more. Indians are consistently showing high uptake rates. Whites and Others have generally high uptake rates but vary by the arms. By route, MSP sample is found to reject the test offers more often. HCT route has higher uptake rates, however, compliance to the check up is lower than MSP sample where the latter is compulsory to take the checks.

We implemented four interventions: delayed notification, opt out, risk assessment, supportive in-

formation. Virtually no one exercised the option of delayed notification, so we used it as a control arm. Opt out resulted in negative impacts on uptake among White-Others in HCT sample. Risk assessment showed marginally significant positive impacts on White-Others in MSP sample. Supportive information increased the uptake of Indians and African-Colored by 6 to 16% points and more so for White-Others. We thus find substantial heterogeneity in responses by ethnicity.

For the Africans and Colored in MSP sample, all experimental arms but supportive information were ineffective in increasing the uptake. Their responses to test offers are smallest among all ethnic groups. This general aversion to tests among Africans and Colored is common in both MSP and HCT samples to a different degree, albeit their educational background differ significantly. We thus conjecture that factors related to their ethnic institutions other than formal institutions, such as education or workplace, to be the important deterrents to tests.

Risk assessment by nurses resulted in lower detection of HIV among White-Others in MSP sample, and DVD viewing resulted in higher detection among African-Colored in both sample. It is advisable not to motivate nurses to enroll more subjects to the tests, and more inpersonal DVD viewing in an isolated room can increase the uptake.

For policy purposes, we introduced the concept of detection probability using uptake and infection probabilities. We found that, despite lower uptake rates, detection rates of seropositive cases among African-Colored are greater than the other groups. This applies both to MSP and HCT sample. This implies that African-Colored are of most-at-risk population among the employees. We also found that nurse's risk assessment tended to pick up safer individuals, thus lowering the detection rates.

We find that subjective probability, number of boy friends and girl friends to be positively correlated with detection. In addition to current practice of asking education and age, we recommend to ask subjective probabilities and number of sex partners in targeting the most at-risk population.

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A Definitions of stigma

Fear: Reluctance or aversion to face the disease (even in isolation of social repercussions) (our working definition).

Stigma: An attribute or a label that sets a person apart from others and links the labeled person to undesirable characteristics (Fortenberry et al., 2002).

Stigma: As a trait, a stigma is an attribute or characteristic that is viewed negatively by the culture or society. As an outcome, stigma occurs when the negative social meanings attached to the discrediting attribute become linked to the individual. With that linkage the person's social identity changes, resulting in less than full acceptance of the person in social interaction, identity engulfment (in which the trait becomes the defining aspect of the person, coloring all other information about him or her), and limitation of the opportunities that would otherwise be available (Berger et al., 2001, citing Goffman (1963)'s work).

HIV-related stigma and discrimination A process of devaluation of people either living with or associated with HIV and AIDS ... Discrimination follows stigma and is the unfair and unjust treatment of an individual based on his or her real or perceived HIV status (UNAIDS, 2003). If found to be HIV positive, one can expect "abandonment by spouse and/or family, social ostracism, job and property loss, school expulsion, denial of medical services, lack of care and support, and violence. These consequences, or fear of them, mean that people are less likely to come in for HIV testing, disclose their HIV status to others, adopt HIV preventive behaviour, or access treatment, care and support. If they do, they could lose everything (UNAIDS, 2007).

stigma exists if: when: "the elements of labelling, stereotyping, separation, status loss, and discrimination occur together in a power situation that allows them" (Link and Phelan, 2001).

B Previous empirical research on stigma and HIV/AIDS

B.1 Measurement of stigma

Bendell et al. (2003) summarizes corporate surveys and notes that stigma and prejudice to be the key barriers in acting on HIV/AIDS. Berger et al. (2001) cite foregoing papers and note that concerns with stigma is widespread among PLWHA: Being rejected and fearing rejection have often been cited as major stressors of having HIV. However, impacts of stigma is not clearly identified in the previous literature. This is because stigma is difficult to measure, and this makes it also difficult to establish the causal relationship on uptake.

In measuring stigma, previous studies have relied on descriptive assessment or self-reported feeling of stigma in the questionnaire, all of which are subjective data (MacQuarrie et al., 2009). Stigma is often measured with the HIV-related Stigma Scale of Berger et al. (2001). This 40-item tool has 4 sub (Likert) scales: personalized stigma, disclosure concerns, negative self-image, and concern

over public attitudes toward PLWH.[*22] All items are answered using a 4-point Likert items (strongly disagree, disagree, agree, strongly agree).

While self-reported items and their scales are informative, they are ordinal in nature and cannot be used directly as covariates in estimation due to difficulty in interpersonal comparisons, as the latter requires cardinality. The availability of panel data takes away the demerits in the use of Lickert scales if used with ordered conditional logit model of Chamberlain (1980), which allows for individual fixed effects and individual theresholds. However, it requires the scales to be time-variant (due other than to errors in self-evaluation). This becomes more plausible when stigma reduction factors change due to successful policies or social programs.

Even if we can measure stigma, it is considered to suffer from an omitted variable bias in estimating its impacts on uptake decisions. For example, a person who is very careful may consider the chance of being stigmatized by test taking to be large, at the same time he has a less reason to take tests, causing a negative correlation between stigma and regression residuals, which inflates the magnitude of estimated (presumably negative) stigma impacts, had it been regressed in the absense of carefulness variable. It is difficult to find variables that can influence stigma but not uptake, or an instrumental variable, in the absense of RCT. Even with an RCT, one still cannot directly measure stigma, so one should note that any study that claims to have reduced stigma that resulted in increased uptake rates is in fact testing for the joint hypothesis of having been able to alter stigma-reduction factors and these factors have reduced stigma impacts on uptake.

B.2 Reported causal impacts of stigma

The impacts of stigma is considered to be negative on the uptake. First line of studies use subjective information. Herek et al. (2003) use US telephone interview data and find that more than a third of respondents indicated that uptake is not going to be affected by stigma. Simbayi et al. (2007) use Cape Town PLWHA data and find that 1/5 have lost a place to stay or job due to the HIV status, and internalized stigma is found to have significant impacts on cognitive-affective depression scores. Kalichman and Simbayi (2003), using Cape Town data, find that people who had not been tested have a high risk of being infected with HIV, as 28% of them had a history of being diagnosed with STDs and genital ulcers. This means that there is a group of high risk individuals who knowingly take risks but do not get tested. Kalichman and Simbayi (2003) interpret a cause of this rejection is due to stigma and endorse the promotion of confidentiality of testing, protection of human rights of PLWHA, among other things.[*23] In studying an informal settlement in South Africa, Mills (2006) shows ethnographically that HIV status can be treated with particular sign languages

[*22] Personalized stigma addressed the perceived consequences of other people knowing that the respondent has HIV, such as losing friends, feeling that people were avoiding him/ her, and regrets for having told some people. Disclosure concerns are related to controlling information, such as keeping one's HIV status secret, or worrying that others who knew the respondent's HIV status would tell. Negative self-image is feelings of shame and guilt, including feeling unclean, not as good as others, or like a bad person because of HIV. Concern over public attitudes toward PLWH includes what "most people" think about a person with HIV or what "most people" with HIV can expect when others learn they have HIV, and includes discrimination and employability.

[*23] Our finding from the project is broadly in line with them, but goes further beyond that these two may not suffice.

and social downward mobility, all of which keep individuals from seeking care at local clinics. In neighboring Botswana, Wolfe et al. (2008) suggests that 40% of patients on ART delayed testing, mostly due to stigma. These studies are suggestive yet make use of subjective information which limits its capacity to be accepted as scientific evidence.

Impacts of fears and stigma have rarely been examined empirically with objective data. An exception is Young and Bendavid (2010) who found from US out patient visit data a positive correlation between HIV testing and use of unrelated tests, and between HIV testing and HIV as a secondary reason for visit rather than first. They interpret their results that individuals seeking HIV tests look for a cover to avoid stigma. While we believe their interpretation is highly likely, as they note, it is a correlation not a causal relationship. In particular, the reverse causality of "multiple testing $\Rightarrow$ HIV/AIDS testing" arises when the unhealthy people get various ailments including HIV/AIDS.

In a rare prospective study, Perry et al. (1991) use video sessions on 1,307 physically asymptomatic adults in the US and assessed their impacts on emotional distress scaled by five standardized distress measures at entry and 3 months later. They found that video sessions reduced emotional distress of HIV negative subjects but no impacts on HIV positive subjects, while stress prevention training reduced stresses on both seronegative and seropositive subjects. Simpson et al. (1998) offered HIV tests on pregnant women at antenatal clinics with randomized length of discussions with midwives and randomized contents of leaflets. Subjects under the treated arms, or those who had discussed with midwives or had been exposed to leaflets, had higher uptake rates between 31.6% to 37.0% compared to 5.5% of control arm. There was no statistically significant difference among the treated arms. Young et al. (2007) have conducted a series of lab experiments on a group of undergraduate students at Stanford. Their study is of interest as it focuses on how non-stigmatized people react to HIV stigma when they are stigmatized. They found that adding unprotected sex, a source of stigma that being immoral, to a list of potential causes of disease reduces the likelihood of individuals requesting a test, which is considered to be due to stigmatization, although the sample size is small (36).[*24]

In the economics literature, Godlonton and Thornton (2012) use a randomized control trial that distributes cash incentives to get tested and estimate the net impacts of peer group effects. The peer group is assumed to be neighbors, and thus is treated as exogenously given in their estimation. To deal with the reflexion problem of (or a matching-induced correlation between) peer groups with oneself, they use cash incentive amounts of neighbors as an instrumental variable for neighbor's test taking experiences. They find the elasticity of peer effects on test uptake to be 0.11, and some suggestive evidence of retardation of intrinsic incentives through peer effects. Ngatia (2011) captures all important social networks by each resident in rural villages and estimate their peer effects on uptake. She assumes the stigma is larger for individuals whose neighbors get tested for smaller cash incentives, and finds stigma reduces uptake. This literature considers the important question of

[*24] This is in line with *conjunction fallacy* that Tversky and Kahneman (1983) posited, as adding a cause decreased the chance, which is a violation of the probability axiom. In their experiments, fear is controlled to be the same between the case with and without unprotected sex as a potential cause of disease, because the disease they reveal to the subjects is the same.

whether extrinsic incentives undermine the intrinsic incentives, however, this topic is out of scope of our paper. Both studies have not tested for impacts of stigma on uptake, but a joint hypothesis as written in the above.

B.3 Causal impacts of fear

It is suggested that receiving results also becomes an impediment to know one's status. In a study measuring returns for STD test results to 258 at-risk adolescents who have voluntarily come to the clinic in Cleveland, US between 1997 and 1998, 58% choose not to return to be notified the results (Lazebnik et al., 2001). The returners are more likely to have had private health insurance, unprotected sex while using illegal drugs and alcohol, and previous attendance at the clinic only for HIV testing. This behaviour is consistent with hyperbolic discounting of Ainslie and Haslam (1992); Laibson (1997), or resultant procrastination.

C Standard errors of marginal effects in probit estimation

Probit marginal effect:

$$\frac{\partial \Pr[y=1]}{\partial x_{ij}} = \phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j.$$

Given that we do not know which $\mathbf{x}_i$ to use, one can average over all observations. That is:

$$\frac{\partial \Pr[y=1]}{\partial x_{\cdot j}} = \bar{\phi}\beta_j = \beta_j \sum_{i=1}^{N} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N}.$$

Standard error of this marginal effects is obtained by delta method. Note that:

$$\mathcal{V}\left[a_j(\beta_j)\right] \xrightarrow{p} a_j'(\beta_i)^2\sigma^2_{\beta_j}.$$

Here,

$$a_j(\beta_j) = \beta_j \sum_{i=1}^{N} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N},$$

then

$$\frac{\partial a_j(\beta_j)}{\partial \beta_j} = \sum_{i=1}^{N} \frac{\phi'(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j x_{ij} + \phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N} = \sum_{i=1}^{N} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j x_{ij}u_i + \phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N} = \sum_{i=1}^{N} \frac{1+\beta_j x_{ij}u_i}{N}\phi(\boldsymbol{\beta}'\mathbf{x}_i).$$

So

$$a_j'(\beta_j)^2\sigma^2_{\beta_j} = \left[\sum_{i=1}^{N} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j x_{ij}u_i + \phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N}\right]^2 \sigma^2_{\beta_j}.$$

If in a vector form, we will need to consider cross derivatives. Typical off diagonal elements are:

$$\frac{\partial a_j(\boldsymbol{\beta})}{\partial \beta_k} = \beta_j \sum_{i=1}^{N} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)x_{ik}u_i}{N} = \sum_{i=1}^{N} \frac{\beta_j x_{ik}u_i}{N}\phi(\boldsymbol{\beta}'\mathbf{x}_i).$$

In a vector form, the vector function is given as:

$$\boldsymbol{a}(\boldsymbol{\beta}) = \begin{pmatrix} \beta_1 \\ \vdots \\ \beta_G \end{pmatrix} \bar{\phi}(\boldsymbol{\beta}) = \begin{bmatrix} a_1(\boldsymbol{\beta}) \\ \vdots \\ a_J(\boldsymbol{\beta}) \end{bmatrix}.$$

Its gradient is not symmetric (as functional forms differ):

$$\begin{aligned} \boldsymbol{D} = \Delta_{\beta}\boldsymbol{a}(\boldsymbol{\beta}) &= \begin{bmatrix} \frac{\partial a_1(\beta)}{\partial \beta_1} & \frac{\partial a_1(\beta)}{\partial \beta_2} & \cdots & \frac{\partial a_1(\beta)}{\partial \beta_J} \\ \frac{\partial a_2(\beta)}{\partial \beta_1} & \frac{\partial a_2(\beta)}{\partial \beta_2} & \cdots & \frac{\partial a_2(\beta)}{\partial \beta_J} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\partial a_J(\beta')}{\partial \beta_1} & \frac{\partial a_J(\beta')}{\partial \beta_2} & \cdots & \frac{\partial a_J(\beta)}{\partial \beta_J} \end{bmatrix}, \\ &= \frac{1}{N}\sum_{i=1}^{N} \begin{bmatrix} 1+\beta_1 x_{i1}u_i & \beta_1 x_{i2}u_i & \cdots & \beta_1 x_{iJ}u_i \\ \beta_2 x_{i1}u_i & 1+\beta_2 x_{i2}u_i & \cdots & \beta_2 x_{iJ}u_i \\ \vdots & \vdots & \ddots & \vdots \\ \beta_J x_{i1}u_i & \beta_J x_{i2}u_i & \cdots & 1+\beta_J x_{iJ}u_i \end{bmatrix} \phi(\boldsymbol{\beta}'\mathbf{x}_i), \\ &= \boldsymbol{I}_J\bar{\phi} + \boldsymbol{\beta}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)u_i\mathbf{x}_i'}{N}. \end{aligned}$$

So asymptotic covariance of $\boldsymbol{a}(\boldsymbol{\beta})$ is $\boldsymbol{D}\mathcal{V}[\boldsymbol{\beta}]\boldsymbol{D}'$.

For a linear combination of parameters, say, $\beta_j + \beta_k = \boldsymbol{g}'\boldsymbol{\beta}$ with $g_j = g_k = 1$ and other elements are zero, we have:

$$c(\boldsymbol{\beta}) = \frac{\partial \Pr[y=1]}{\partial x_{\cdot j}} + \frac{\partial \Pr[y=1]}{\partial x_{\cdot k}} = \sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)(\beta_j+\beta_k)}{N} = \boldsymbol{g}'\boldsymbol{\beta}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N}$$

The asymptotic variance of this linear combination of parameters is given by taking a derivative for all parameters. Its typical element $m \neq j$ and $m \neq k$ is given by:

$$\frac{\partial c}{\partial \beta_m} = \boldsymbol{g}'\boldsymbol{\beta}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)x_{im}u_i}{N},$$

and for element j (or k):

$$\frac{\partial c}{\partial \beta_j} = g_j\bar{\phi} + \boldsymbol{g}'\boldsymbol{\beta}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)x_{ij}u_i}{N}.$$

In a set of linear combinations, we have $\boldsymbol{G}\boldsymbol{\beta}$ to derive their asymptotic variances where $\boldsymbol{G}$ is a $G \times J$ matrix. Then we have

$$\boldsymbol{c}(\boldsymbol{\beta}) = \begin{pmatrix} \boldsymbol{g}_1'\boldsymbol{\beta} \\ \vdots \\ \boldsymbol{g}_G'\boldsymbol{\beta} \end{pmatrix}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N} = \boldsymbol{G}\boldsymbol{\beta}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)}{N} = \boldsymbol{G}\boldsymbol{\beta}\bar{\phi} = \boldsymbol{G}\boldsymbol{a}(\boldsymbol{\beta}).$$

Its gradient is given as

$$
\begin{aligned}
\boldsymbol{D}_G = \boldsymbol{\Delta}_{\boldsymbol{\beta}}\boldsymbol{c}(\boldsymbol{\beta}) &= \begin{bmatrix} \frac{\partial(\boldsymbol{g}_1'\boldsymbol{a}(\boldsymbol{\beta}))}{\partial\beta_1} & \cdots & \frac{\partial(\boldsymbol{g}_1'\boldsymbol{a}(\boldsymbol{\beta}))}{\partial\beta_J} \\ \vdots & \vdots & \vdots \\ \frac{\partial(\boldsymbol{g}_G'\boldsymbol{a}(\boldsymbol{\beta}))}{\partial\beta_1} & \cdots & \frac{\partial(\boldsymbol{g}_G'\boldsymbol{a}(\boldsymbol{\beta}))}{\partial\beta_J} \end{bmatrix} \\
&= \frac{1}{N}\sum_{i=1}^{N}\left[\begin{pmatrix} g_{11} & \cdots & g_{1J} \\ \vdots & & \vdots \\ g_{G1} & \cdots & g_{GJ} \end{pmatrix} + \begin{pmatrix} \boldsymbol{g}_1'\boldsymbol{\beta}x_{i1} & \cdots & \boldsymbol{g}_1'\boldsymbol{\beta}x_{iJ} \\ \vdots & \ddots & \vdots \\ \boldsymbol{g}_G'\boldsymbol{\beta}x_{i1} & \cdots & \boldsymbol{g}_G'\boldsymbol{\beta}x_{iJ} \end{pmatrix} u_i\right]\phi(\boldsymbol{\beta}'\mathbf{x}_i), \\
&= \frac{1}{N}\sum_{i=1}^{N}\left[\boldsymbol{G} + \begin{pmatrix} g_{11} & \cdots & g_{1J} \\ \vdots & & \vdots \\ g_{G1} & \cdots & g_{GJ} \end{pmatrix}\begin{pmatrix} \beta_1 \\ \vdots \\ \beta_J \end{pmatrix}\begin{pmatrix} x_{i1} & \cdots & x_{iJ} \end{pmatrix} u_i\right]\phi(\boldsymbol{\beta}'\mathbf{x}_i), \\
&= \boldsymbol{G}\left(\bar{\phi} + \boldsymbol{\beta}\sum_{i=1}^{N}\frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)u_i\mathbf{x}_i'}{N}\right).
\end{aligned}
$$

Then its asymptotic covariance matrix is given by $\boldsymbol{D}_G\mathcal{V}[\boldsymbol{\beta}]\boldsymbol{D}_G'$.

When evaluating the differential impacts of arms by ethnicity, we need to compare if ethnicity impacts may differ under each arm. So for Africans, for example, average impact of opt out is given by $\beta_{\text{africans} \times \text{opt out}} + \beta_{\text{africans}}$.

D Descriptive statistics

In controlling for the riskiness of each respondents, we asked a series of queries about past risky behaviours. In addition, we asked how they evaluate their risk of infection. We asked:

> What do you think the chances are that you are infected with HIV? Please choose one from scale of 0 to 10 and circle the chosen number. “0” means “no likelihood” and “10” means “certain”.

Use of subjective probability from survey questions is discussed and encouraged generally in Manski (2004), and in Delavande et al. (2011) under a developing country contect. Subjective probabilities, rather than Lickert scales oft used in other literature, has an advantage of being comparable intra- and inter-personally, thereby allowing to be used directly in estimation. Disadvantage is the possibility of misunderstanding of probability concept by the respondents. However, as we have explained the meaning of scales to all subjects, we believe such a possibility is minimal.

E Detailed Estimated Results and Robustness Checks

In Table A3, Table A4, Table A5Table A6, we show the estimated results of probit model under sample selection criterion up to (3). As can be seen in uptake among MSP, the point estimates are more than halved in magnitude and standard errors increased slightly, resulting in less precise estimates but still retain statistical significance at 5% level. Results for HCT sample remain unchanged from Table 6, as there was fewer observations dropped between criteria (2) and criteria (3).

Table 5, Table 6, Table A7, Table A8, Table 7, Table 8 show estimated results of uptake MSP, uptake HCT, infection MSP, infection HCT, detection MSP, detection HCT, respectively. Infection probits

TABLE A1: VARIABLE DESCRIPTION

short	questions
uptake	HIV test
infection	Rapid test result
age / 10	Age / 10
$(\text{age} / 10)^2$	(Age / 10) squared
BMI / 10	BMI / 10
number of bf gf	Extramarital parters, BF, GF: How many people did you have sex with?
visitor number of the area	Visitor number
multiple partners	indicator if there is more than 1 sex partner
casual partners	indicator if there is a sex partner other than spouse, boyfriend, girlfriend
single	indicator if number of spousal sex parnter is zero
STD times	How many times in the past 10 years have you had a sexually transmitted infection such as gonorrhoea, syphilis, genital herpes, genital warts, genital ulcers, clamidia?
STI screen	Number of affirmatives to STI screening questions
TB screen	Number of affirmatives to TB screening questions
subjective probability	What do you think the chances are that you are infected with HIV? Part 1
days since HCT began / 100	Days / 100 since the start of HCTI
$(\text{days since HCT began} / 100)^2$	days squared
hourly paid workers	What is your grade level? Hourly (yes) / Salaried (no)?
years at Company	Years worked
HCT before	Have you ever taken an HIV counseling and testing before?
gender (female = 1)	Sex
correct on life year question	indicator if correct to "life years of PLWHA" question
relatives positive	Relatives: Are HIV positive?
friends positive	Friends/Neighbours: Are HIV positive?
colleagues positive	Colleagues: Are HIV positive?
relatives died	Relatives: Have died of HIV/AIDS?
friends died	Friends/Neighbours: Have died of HIV/AIDS?
colleagues died	Colleagues: Have died of HIV/AIDS?

use only HIV test taker sample and the regressand takes the value of 1 if found to be HIV positive, 0 otherwise. Detection probit estimates the incidence of detecting HIV positive cases, where the regressand takes the value of 1 if tested and infected, 0 otherwise. Detection probit may be of interest to policy makers who wants to know at what rate one can find HIV positive cases under certain interventions.

Infection probit estimates show Africans and Colored are more likely to be infected than Indians, Whites and Others are less likely to be infected than Indians. Tertiary education is strongly negatively associated with infection probability. Estimates on elapsed period since the launch of the promotion is positive, indicating that, as the days pass, more number of riskier individuals have taken the tests. We note positive estimates on risk assessment and negative estimates on supportive information which suggest that we have picked up, riskier Indians under the former and less risker Indians under the latter. Nevertheless, risk assessment picked up less risky individuals among Africans and Colored, and Whites and Others. So it is not particularly effective for the risky population. The arm of supportive information picked up even further less risky Africans and Colored, so it is also not effective in attracting the risky group. As suggested in the exploratory analysis, subjective probability is positively correlated with the infection probability.

In FIGURE A1, we plot the uptake rates by nurse and ethnicity of subjects. All nurses are African females. We observe small variations in uptake rates among Indians and White-Others by nurse, but

TABLE A2: DESCRIPTIVE STATISTICS

variables	min	25%	median	75%	max	mean	std	0s	NAs	n
uptake	0.000	1.000	1.000	1.000	1.000	0.800	0.400	469	0	2722
infection	0.000	0.000	0.000	0.000	1.000	0.000	0.200	2155	471	2722
african / colored	0.000	0.000	1.000	1.000	1.000	0.700	0.500	940	0	2722
indian	0.000	0.000	0.000	0.000	1.000	0.200	0.400	2057	0	2722
white / other	0.000	0.000	0.000	0.000	1.000	0.100	0.300	2447	0	2722
hct	0.000	0.000	0.000	1.000	1.000	0.500	0.500	1404	0	2722
msp	0.000	0.000	1.000	1.000	1.000	0.500	0.500	1318	0	2722
high school	0.000	0.000	0.000	1.000	1.000	0.400	0.500	1682	11	2722
higher primary	0.000	0.000	0.000	1.000	1.000	0.400	0.500	1509	11	2722
lower primary or less	0.000	0.000	0.000	0.000	1.000	0.100	0.300	2390	11	2722
master's degree	0.000	0.000	0.000	0.000	1.000	0.000	0.100	2694	11	2722
tertiary education	0.000	0.000	0.000	0.000	1.000	0.100	0.200	2569	11	2722
age / 10	0.100	2.900	3.600	4.600	6.500	3.800	1.000	0	5	2722
$(\text{age} / 10)^2$	0.000	8.400	13.000	21.200	42.200	15.300	8.200	0	5	2722
(BMI-22) / 10	−1.300	0.200	0.500	0.800	8.900	0.500	0.600	0	3	2722
number of bf gf	0.000	0.000	0.000	1.000	12.000	0.600	0.900	1537	13	2722
visitor number of the area	1.000	1.000	3.000	4.000	21.000	3.500	2.900	0	0	2722
multiple partners	0.000	0.000	0.000	0.000	1.000	0.200	0.400	2064	0	2722
casual partners	0.000	0.000	0.000	0.000	1.000	0.100	0.200	2544	0	2722
single	0.000	0.000	0.000	1.000	1.000	0.400	0.500	1621	0	2722
STD times	0.000	0.000	0.000	0.000	20.000	0.300	1.000	2319	6	2722
STI screen	0.000	2.000	2.000	2.000	10.000	2.000	0.800	183	4	2722
TB screen	0.000	0.000	0.000	0.000	10.000	0.600	1.300	2105	4	2722
subjective probability (0 - 1)	0.000	0.000	0.000	0.300	1.000	0.200	0.200	1297	146	2722
days since HCT began / 100	0.600	0.800	1.300	1.500	1.800	1.200	0.400	0	0	2722
$(\text{days since HCT began} / 100)^2$	0.300	0.700	1.600	2.300	3.100	1.500	0.900	0	0	2722
hourly paid workers	0.000	0.000	1.000	1.000	1.000	0.500	0.500	1231	32	2722
years at Company	0.000	4.000	7.000	19.000	40.000	11.100	9.500	1	9	2722
have tested before	0.000	0.000	1.000	1.000	1.000	0.700	0.400	697	0	2722
gender (female = 1)	0.000	0.000	0.000	0.000	1.000	0.200	0.400	2175	9	2722
correct on life year question	0.000	0.000	1.000	1.000	1.000	0.700	0.500	828	0	2722
relatives positive	0.000	0.000	0.000	1.000	1.000	0.300	0.400	2012	23	2722
friends positive	0.000	0.000	0.000	0.000	1.000	0.200	0.400	2087	22	2722
colleagues positive	0.000	0.000	0.000	0.000	1.000	0.100	0.300	2418	22	2722
relatives died	0.000	0.000	0.000	1.000	1.000	0.300	0.400	1984	34	2722
friends died	0.000	0.000	0.000	0.000	1.000	0.200	0.400	2117	38	2722
colleagues died	0.000	0.000	0.000	0.000	1.000	0.100	0.300	2378	30	2722

Notes: 1. Based on the sample using delayed notification as the control. Following observations are dropped: individuals with route, ethnicity, test taking information is missing, individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

variations are considerable among the Africans. This implies that nurse's individual contribution can be large, and we may need to take it into considerations when selecting and training the nurses.

In TABLE A9 and TABLE A10, we show the estimated uptake probit results using the nurse fixed effects in place of area fixed effects. We cannot use the both fixed effects simultaneously in the same regression as they are highly collinear and standard errors of nurse effects become very large. The estimated results do not differ from our main results and show their robustness.

Table A3: Uptake Probit, MSP Sample, Marginal Effects, Criteria (3)

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	0.176***	1.158***	1.327***	1.332***	1.296***	1.430***	1.304***	1.333***	1.311***
	(0.026)	(0.183)	(0.205)	(0.212)	(0.213)	(0.233)	(0.233)	(0.314)	(0.310)
arm (optout)	0.015	0.014	0.013	0.011	0.033	0.031	0.027	0.026	0.028
	(0.033)	(0.031)	(0.030)	(0.031)	(0.044)	(0.045)	(0.043)	(0.044)	(0.044)
arm (assess)	0.068*	0.057	0.057*	0.056	0.068*	0.067*	0.060	0.049	0.050
	(0.037)	(0.035)	(0.034)	(0.034)	(0.039)	(0.040)	(0.039)	(0.039)	(0.040)
arm (supp)	0.067**	0.064**	0.060*	0.058*	0.159***	0.156***	0.141***	0.142***	0.143***
	(0.033)	(0.031)	(0.031)	(0.031)	(0.042)	(0.042)	(0.040)	(0.042)	(0.042)
african / colored		−0.397***	−0.379***	−0.375***	−0.378***	−0.364***	−0.312***	−0.297***	−0.302***
		(0.053)	(0.053)	(0.054)	(0.056)	(0.055)	(0.054)	(0.054)	(0.054)
white / other		−0.075	−0.083	−0.089	0.117	0.120	0.115	0.115	0.107
		(0.084)	(0.095)	(0.094)	(0.081)	(0.081)	(0.077)	(0.080)	(0.079)
age / 10		−0.328***	−0.360***	−0.353***	−0.350***	−0.386***	−0.326***	−0.343***	−0.346***
		(0.090)	(0.095)	(0.096)	(0.096)	(0.106)	(0.107)	(0.105)	(0.103)
(age / 10)^2		0.041***	0.045***	0.045***	0.045***	0.048***	0.041***	0.041***	0.041***
		(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.012)
BMI / 10		−0.038*	−0.032*	−0.033*	−0.034*	−0.036*	−0.041**	−0.042**	−0.042**
		(0.020)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
number of bf gf		−0.028**	−0.028**	−0.028**	−0.028**	−0.009	−0.004	−0.008	−0.009
		(0.013)	(0.013)	(0.013)	(0.013)	(0.019)	(0.019)	(0.018)	(0.019)
higher primary				0.002	0.003	0.001	−0.019	−0.018	−0.022
				(0.033)	(0.034)	(0.034)	(0.035)	(0.036)	(0.036)
high school				0.017	0.019	0.015	−0.003	−0.028	−0.038
				(0.038)	(0.038)	(0.038)	(0.039)	(0.041)	(0.041)
tertiary education				0.016	0.023	0.008	−0.008	−0.084	−0.064
				(0.208)	(0.203)	(0.210)	(0.207)	(0.221)	(0.236)
arm (optout) * african / coloured					−0.057	−0.053	−0.059	−0.039	−0.044
					(0.151)	(0.151)	(0.145)	(0.148)	(0.148)
arm (optout) * white / other					0.093	0.109	0.088	0.125	0.110
					(0.245)	(0.245)	(0.231)	(0.235)	(0.234)
arm (assess) * african / coloured					0.067	0.063	0.056	0.061	0.072
					(0.135)	(0.134)	(0.130)	(0.131)	(0.133)
arm (assess) * white / other					0.373*	0.376**	0.359**	0.359*	0.331*
					(0.191)	(0.190)	(0.182)	(0.186)	(0.186)
arm (supp) * african / coloured					−0.023	−0.020	−0.026	−0.030	−0.039
					(0.147)	(0.147)	(0.142)	(0.143)	(0.142)
arm (supp) * white / other					1.034***	1.017***	0.972***	0.961***	0.932***
					(0.194)	(0.192)	(0.184)	(0.188)	(0.186)
multiple partners						−0.022	−0.016	−0.019	−0.013
						(0.036)	(0.037)	(0.036)	(0.036)
other partners						0.056	0.038	0.032	0.027
						(0.046)	(0.045)	(0.044)	(0.045)
single						−0.059*	−0.051	−0.044	−0.045
						(0.034)	(0.034)	(0.034)	(0.034)
STD times						−0.005	−0.007	−0.006	−0.005
						(0.012)	(0.014)	(0.014)	(0.014)
STI screen						−0.014	−0.007	−0.006	−0.005
						(0.014)	(0.015)	(0.015)	(0.015)
TB screen						−0.009	−0.006	−0.005	−0.006
						(0.008)	(0.008)	(0.008)	(0.008)
subjective probability							−0.119**	−0.116**	−0.108**
							(0.052)	(0.051)	(0.052)
days since HCT began / 100								0.169	0.128
								(0.354)	(0.354)
(days since HCT began / 100)^2								−0.112	−0.093
								(0.150)	(0.151)
hourly paid workers								−0.046	−0.038
								(0.032)	(0.032)
years at Company								0.001	0.001
								(0.002)	(0.002)
HCT before									0.068***
									(0.026)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.004	0.107	0.127	0.128	0.13	0.134	0.134	0.142	0.147
n	1361	1353	1353	1348	1348	1345	1262	1242	1242

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. MSP sample only. xcluded observations under an additional criteria (3) who rejects testing by saying that one is sure about status and claims that subjective probability of infection is 100% (59 observations).

Table A4: Uptake Probit, HCT Sample, Marginal Effects, Criteria (3)

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	0.187***	0.502***	0.484***	0.482***	0.498***	0.556***	0.540***	0.607***	0.607***
	(0.022)	(0.131)	(0.135)	(0.130)	(0.136)	(0.144)	(0.144)	(0.231)	(0.232)
arm (optout)	0.001	0.005	0.005	0.004	0.016	0.017	0.017	0.019	0.019
	(0.022)	(0.021)	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)
arm (assess)	−0.016	−0.010	0.006	0.005	0.003	0.003	0.003	0.008	0.008
	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
arm (supp)	−0.013	−0.009	−0.012	−0.012	−0.009	−0.010	−0.014	−0.010	−0.010
	(0.020)	(0.020)	(0.022)	(0.021)	(0.019)	(0.019)	(0.018)	(0.019)	(0.019)
african / colored		−0.065***	−0.094***	−0.095***	−0.098***	−0.092***	−0.072***	−0.070***	−0.070***
		(0.019)	(0.019)	(0.018)	(0.020)	(0.019)	(0.018)	(0.018)	(0.018)
white / other		−0.050**	−0.045**	−0.040*	−0.019	−0.016	−0.015	−0.011	−0.011
		(0.024)	(0.022)	(0.022)	(0.023)	(0.023)	(0.021)	(0.021)	(0.021)
age / 10		−0.147**	−0.135*	−0.129*	−0.139*	−0.160**	−0.162**	−0.157*	−0.157*
		(0.066)	(0.070)	(0.070)	(0.074)	(0.078)	(0.078)	(0.081)	(0.081)
(age / 10)^2		0.018**	0.017*	0.016*	0.017*	0.019*	0.019*	0.017*	0.017*
		(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)
BMI / 10		−0.010	−0.008	−0.008	−0.007	−0.004	0.001	0.002	0.002
		(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
number of bf gf		0.003	−0.002	−0.001	−0.001	0.001	0.005	0.002	0.002
		(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
higher primary				−0.025	−0.022	−0.020	−0.019	−0.021	−0.021
				(0.034)	(0.033)	(0.032)	(0.031)	(0.033)	(0.033)
high school				0.007	0.009	0.008	0.007	0.005	0.005
				(0.035)	(0.034)	(0.032)	(0.031)	(0.035)	(0.035)
tertiary education				0.003	0.011	0.012	0.009	0.008	0.008
				(0.040)	(0.040)	(0.037)	(0.035)	(0.039)	(0.039)
master's degree				−0.067	−0.058	−0.066	−0.070	−0.071	−0.071
				(0.052)	(0.050)	(0.049)	(0.047)	(0.050)	(0.050)
arm (optout) * african / coloured					0.004	0.016	0.010	0.007	0.007
					(0.053)	(0.052)	(0.047)	(0.048)	(0.048)
arm (optout) * white / other					−0.132**	−0.120**	−0.114**	−0.109**	−0.109**
					(0.058)	(0.057)	(0.052)	(0.054)	(0.054)
arm (assess) * african / coloured					0.012	0.014	−0.027	−0.022	−0.022
					(0.046)	(0.045)	(0.041)	(0.043)	(0.043)
arm (assess) * white / other					−0.049	−0.048	−0.077	−0.075	−0.075
					(0.061)	(0.061)	(0.054)	(0.054)	(0.054)
arm (supp) * african / coloured					−0.020	−0.014	−0.021	−0.011	−0.011
					(0.045)	(0.044)	(0.042)	(0.043)	(0.043)
arm (supp) * white / other					−0.001	−0.002	−0.004	0.000	0.001
					(0.059)	(0.059)	(0.055)	(0.056)	(0.056)
multiple partners						0.032	0.027	0.031	0.031
						(0.022)	(0.026)	(0.025)	(0.025)
other partners						−0.014	−0.009	−0.014	−0.014
						(0.028)	(0.028)	(0.028)	(0.028)
single						−0.034**	−0.027*	−0.022	−0.022
						(0.015)	(0.016)	(0.016)	(0.016)
STD times						−0.009*	−0.006	−0.005	−0.005
						(0.005)	(0.005)	(0.004)	(0.004)
STI screen						−0.001	−0.000	−0.002	−0.002
						(0.007)	(0.007)	(0.007)	(0.007)
TB screen						−0.003	−0.003	−0.002	−0.002
						(0.006)	(0.006)	(0.006)	(0.006)
subjective probability							−0.121***	−0.121***	−0.120***
							(0.027)	(0.026)	(0.026)
days since HCT began / 100								−0.256	−0.255
								(0.321)	(0.319)
(days since HCT began / 100)^2								0.131	0.130
								(0.138)	(0.137)
hourly paid workers								0.001	0.001
								(0.021)	(0.021)
years at Company								0.002	0.002
								(0.001)	(0.001)
HCT before									−0.001
									(0.016)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.002	0.051	0.155	0.168	0.187	0.205	0.26	0.265	0.265
n	1310	1307	1307	1302	1302	1300	1240	1225	1225

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. HCT sample only. Excluded observations under an additional criteria (3) who rejects testing by saying that one is sure about status and claims that subjective probability of infection is 100% (59 observations).

Table A5: Detection Probit, MSP Sample, Marginal Effects, Criteria (3)

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	−0.151***	−0.367***	−0.374***	−0.376***	−0.607***	−0.576***	−0.860***	−0.994***	−0.996***
	(0.010)	(0.111)	(0.114)	(0.117)	(0.126)	(0.134)	(0.150)	(0.189)	(0.192)
arm (optout)	0.003	0.006	0.008	0.008	0.007	0.009	0.010	0.006	0.007
	(0.015)	(0.014)	(0.014)	(0.014)	(0.010)	(0.010)	(0.012)	(0.012)	(0.012)
arm (assess)	0.009	0.012	0.011	0.011	0.082***	0.083***	0.084***	0.085***	0.085***
	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.017)	(0.017)
arm (supp)	−0.030*	−0.028*	−0.028*	−0.028*	−0.021*	−0.019	−0.014	−0.027*	−0.026*
	(0.017)	(0.017)	(0.017)	(0.017)	(0.012)	(0.012)	(0.013)	(0.015)	(0.015)
african / colored		0.085***	0.085***	0.085***	0.302***	0.301***	0.274***	0.281***	0.283***
		(0.031)	(0.031)	(0.030)	(0.027)	(0.027)	(0.027)	(0.028)	(0.029)
white / other		−0.254***	−0.264***	−0.280***	−0.072***	−0.068***	−0.066***	−0.066***	−0.070***
		(0.036)	(0.037)	(0.039)	(0.013)	(0.014)	(0.015)	(0.015)	(0.017)
age / 10		0.069	0.062	0.060	0.061	0.040	0.019	0.014	0.012
		(0.056)	(0.056)	(0.058)	(0.058)	(0.063)	(0.065)	(0.067)	(0.068)
(age / 10)^2		−0.008	−0.007	−0.007	−0.007	−0.005	−0.002	−0.002	−0.002
		(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
BMI / 10		−0.002	−0.002	−0.003	−0.002	−0.002	−0.006	−0.007	−0.007
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
number of bf gf		0.010**	0.009*	0.009*	0.009*	0.012*	0.015*	0.014*	0.014*
		(0.005)	(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	(0.008)	(0.008)
higher primary				0.005	0.004	0.006	−0.003	−0.002	−0.003
				(0.018)	(0.018)	(0.018)	(0.019)	(0.020)	(0.021)
high school				0.004	0.003	0.005	−0.007	−0.008	−0.006
				(0.020)	(0.020)	(0.020)	(0.021)	(0.023)	(0.023)
tertiary education				−0.336***	−0.352***	−0.354***	−0.328***	−0.350***	−0.347***
				(0.043)	(0.043)	(0.043)	(0.044)	(0.046)	(0.046)
arm (optout) * african / coloured					0.002	0.002	0.004	0.011	0.010
					(0.016)	(0.017)	(0.018)	(0.021)	(0.023)
arm (optout) * white / other					−0.002	−0.002	0.018	0.012	0.020
					(0.017)	(0.020)	(0.027)	(0.032)	(0.035)
arm (assess) * african / coloured					−0.324***	−0.325***	−0.299***	−0.302***	−0.305***
					(0.046)	(0.047)	(0.047)	(0.049)	(0.049)
arm (assess) * white / other					−0.332***	−0.329***	−0.290***	−0.302***	−0.296***
					(0.048)	(0.049)	(0.045)	(0.051)	(0.053)
arm (supp) * african / coloured					−0.022	−0.025	−0.022	−0.024	−0.028
					(0.019)	(0.020)	(0.020)	(0.021)	(0.021)
arm (supp) * white / other					0.003	0.005	0.020	0.012	0.014
					(0.021)	(0.024)	(0.023)	(0.030)	(0.031)
multiple partners						−0.008	−0.029	−0.030	−0.032
						(0.018)	(0.019)	(0.020)	(0.020)
other partners						0.002	0.009	0.012	0.012
						(0.020)	(0.021)	(0.021)	(0.020)
single						−0.017	−0.022	−0.019	−0.018
						(0.018)	(0.019)	(0.019)	(0.019)
STD times						0.004	−0.002	−0.002	−0.003
						(0.004)	(0.004)	(0.004)	(0.004)
STI screen						0.007	0.004	0.004	0.004
						(0.005)	(0.005)	(0.006)	(0.006)
TB screen						0.001	0.002	0.002	0.002
						(0.003)	(0.004)	(0.004)	(0.004)
subjective probability							0.095***	0.097***	0.098***
							(0.024)	(0.024)	(0.024)
days since HCT began / 100								0.279*	0.299*
								(0.163)	(0.161)
(days since HCT began / 100)^2								−0.116*	−0.125*
								(0.069)	(0.069)
hourly paid workers								−0.010	−0.012
								(0.012)	(0.013)
years at Company								0.001	0.001
								(0.001)	(0.001)
HCT before									−0.019
									(0.013)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.014	0.076	0.102	0.102	0.107	0.116	0.169	0.179	0.185
n	1361	1353	1353	1348	1348	1345	1262	1242	1242

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. MSP sample only. Excluded observations under an additional criteria (3) who rejects testing by saying that one is sure about status and claims that subjective probability of infection is 100% (59 observations).

TABLE A6: DETECTION PROBIT, HCT SAMPLE, MARGINAL EFFECTS, CRITERIA (3)

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	−0.117***	−0.518***	−0.475***	−0.460***	−0.456***	−0.473***	−0.352***	−0.453***	−0.460***
	(0.008)	(0.083)	(0.093)	(0.095)	(0.095)	(0.102)	(0.093)	(0.153)	(0.159)
arm (optout)	−0.005	−0.003	0.001	0.004	−0.001	−0.003	−0.001	−0.002	−0.001
	(0.014)	(0.012)	(0.012)	(0.012)	(0.010)	(0.009)	(0.008)	(0.009)	(0.011)
arm (assess)	−0.023	−0.025*	−0.021	−0.019	−0.017	−0.016	−0.013	−0.016	−0.016
	(0.015)	(0.014)	(0.014)	(0.014)	(0.013)	(0.012)	(0.011)	(0.012)	(0.011)
arm (supp)	−0.009	−0.011	−0.006	−0.006	−0.004	−0.006	−0.005	−0.014	−0.015
	(0.012)	(0.012)	(0.011)	(0.011)	(0.008)	(0.009)	(0.009)	(0.012)	(0.013)
african / colored		0.258***	0.248***	0.249***	0.245***	0.228***	0.177***	0.182***	0.179***
		(0.026)	(0.026)	(0.029)	(0.027)	(0.026)	(0.023)	(0.024)	(0.027)
white / other		−0.002	−0.008	−0.006	−0.001	−0.014	−0.014	−0.007	−0.002
		(0.002)	(0.029)	(0.009)	(0.006)	(0.012)	(0.014)	(0.014)	(0.013)
age / 10		0.085**	0.077*	0.069	0.069	0.076	0.031	0.019	0.026
		(0.037)	(0.042)	(0.043)	(0.043)	(0.048)	(0.045)	(0.045)	(0.044)
(age / 10)^2		−0.009**	−0.009	−0.008	−0.008	−0.008	−0.002	−0.001	−0.001
		(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
BMI / 10		−0.001	−0.004	−0.004	−0.004	−0.006	−0.002	−0.001	−0.002
		(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)
number of bf gf		0.004	0.003	0.002	0.002	−0.003	−0.007	−0.006	−0.006
		(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.007)
higher primary				0.011	0.011	0.013	0.006	0.009	0.013
				(0.017)	(0.017)	(0.017)	(0.018)	(0.020)	(0.018)
high school				−0.014	−0.014	−0.011	−0.020	−0.014	−0.009
				(0.020)	(0.020)	(0.020)	(0.020)	(0.023)	(0.021)
tertiary education				−0.218***	−0.218***	−0.200***	−0.172***	−0.181***	−0.181***
				(0.028)	(0.028)	(0.027)	(0.037)	(0.039)	(0.040)
master's degree				0.003	0.004	0.010	0.022	0.027	0.035
				(0.024)	(0.024)	(0.025)	(0.022)	(0.026)	(0.025)
arm (optout) * african / coloured					0.012	0.005	0.005	0.008	0.005
					(0.021)	(0.020)	(0.014)	(0.020)	(0.029)
arm (optout) * white / other					−0.010	−0.008	−0.019	−0.023	−0.006
					(0.016)	(0.023)	(0.020)	(0.026)	(0.041)
arm (assess) * african / coloured					−0.011	−0.012	0.003	0.011	0.003
					(0.023)	(0.022)	(0.018)	(0.023)	(0.028)
arm (assess) * white / other					−0.020	0.004	0.012	0.015	−0.000
					(0.018)	(0.026)	(0.022)	(0.024)	(0.042)
arm (supp) * african / coloured					−0.006	−0.008	0.007	0.012	0.008
					(0.015)	(0.014)	(0.012)	(0.020)	(0.031)
arm (supp) * white / other					−0.001	0.019	−0.005	−0.001	0.009
					(0.018)	(0.027)	(0.033)	(0.032)	(0.037)
multiple partners						0.002	0.003	0.002	0.000
						(0.012)	(0.012)	(0.012)	(0.013)
other partners						−0.054**	−0.047**	−0.048***	−0.055***
						(0.021)	(0.018)	(0.018)	(0.021)
single						0.027**	0.018*	0.017	0.013
						(0.011)	(0.011)	(0.011)	(0.011)
STD times						0.009**	0.004	0.004	0.003
						(0.004)	(0.003)	(0.003)	(0.004)
STI screen						0.002	0.004	0.004	0.004
						(0.004)	(0.003)	(0.003)	(0.003)
TB screen						−0.000	−0.002	−0.003	−0.002
						(0.003)	(0.003)	(0.003)	(0.003)
subjective probability							0.073***	0.074***	0.076***
							(0.019)	(0.019)	(0.019)
days since HCT began / 100								0.190	0.221
								(0.166)	(0.172)
(days since HCT began / 100)^2								−0.080	−0.091
								(0.068)	(0.070)
hourly paid workers								0.020	0.020
								(0.014)	(0.014)
years at Company								−0.000	−0.001
								(0.001)	(0.001)
HCT before									−0.028**
									(0.011)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.009	0.194	0.244	0.261	0.261	0.3	0.371	0.381	0.408
n	1310	1307	1307	1302	1302	1300	1240	1225	1225

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. HCT sample only. Excluded observations under an additional criteria (3) who rejects testing by saying that one is sure about status and claims that subjective probability of infection is 100% (59 observations).

Table A7: Infection Probit, MSP Sample, Marginal Effects

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	−0.171***	−0.504***	−0.531***	−0.540***	−0.825***	−0.791***	−1.101***	−1.296***	−1.289***
	(0.013)	(0.149)	(0.156)	(0.160)	(0.176)	(0.183)	(0.200)	(0.259)	(0.261)
arm (optout)	0.003	0.007	0.009	0.009	0.010	0.013	0.013	0.010	0.010
	(0.020)	(0.019)	(0.018)	(0.018)	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)
arm (assess)	0.006	0.009	0.009	0.009	0.098***	0.098***	0.093***	0.096***	0.095***
	(0.021)	(0.020)	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)	(0.022)	(0.023)
arm (supp)	−0.045**	−0.042*	−0.042*	−0.042*	−0.027*	−0.027*	−0.019	−0.036*	−0.035*
	(0.022)	(0.022)	(0.022)	(0.022)	(0.016)	(0.016)	(0.017)	(0.019)	(0.019)
african / colored		0.122***	0.119***	0.120***	0.384***	0.380***	0.328***	0.338***	0.340***
		(0.038)	(0.039)	(0.038)	(0.035)	(0.037)	(0.033)	(0.036)	(0.038)
white / other		−0.312***	−0.323***	−0.342***	−0.087***	−0.081***	−0.076***	−0.078***	−0.083***
		(0.046)	(0.047)	(0.048)	(0.016)	(0.020)	(0.020)	(0.020)	(0.024)
age / 10		0.116	0.110	0.109	0.110	0.081	0.046	0.046	0.042
		(0.075)	(0.075)	(0.078)	(0.079)	(0.084)	(0.083)	(0.086)	(0.087)
(age / 10)^2		−0.014	−0.013	−0.013	−0.013	−0.010	−0.005	−0.006	−0.005
		(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
BMI / 10		−0.001	−0.001	−0.002	−0.001	−0.001	−0.005	−0.006	−0.006
		(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)
number of bf gf		0.017**	0.016**	0.016**	0.016**	0.017*	0.021**	0.020**	0.021**
		(0.006)	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)	(0.009)	(0.008)
higher primary				0.008	0.007	0.011	−0.001	0.001	−0.001
				(0.023)	(0.024)	(0.024)	(0.024)	(0.026)	(0.027)
high school				0.008	0.006	0.009	−0.005	−0.002	0.001
				(0.026)	(0.026)	(0.026)	(0.026)	(0.028)	(0.029)
tertiary education				−0.330***	−0.348***	−0.327***	−0.347***	−0.359***	−0.383***
				(0.068)	(0.068)	(0.067)	(0.071)	(0.072)	(0.074)
arm (optout) * african / coloured					−0.003	−0.002	0.003	0.009	0.005
					(0.028)	(0.027)	(0.027)	(0.033)	(0.034)
arm (optout) * white / other					0.005	0.000	0.040	0.047	0.055
					(0.029)	(0.028)	(0.039)	(0.054)	(0.057)
arm (assess) * african / coloured					−0.406***	−0.406***	−0.360***	−0.372***	−0.375***
					(0.061)	(0.061)	(0.062)	(0.066)	(0.065)
arm (assess) * white / other					−0.400***	−0.396***	−0.318***	−0.325***	−0.316***
					(0.062)	(0.062)	(0.056)	(0.068)	(0.068)
arm (supp) * african / coloured					−0.042	−0.046	−0.047	−0.054*	−0.060*
					(0.029)	(0.030)	(0.029)	(0.032)	(0.032)
arm (supp) * white / other					0.009	0.007	0.031	0.031	0.035
					(0.027)	(0.032)	(0.035)	(0.045)	(0.047)
multiple partners						−0.005	−0.034	−0.033	−0.035
						(0.022)	(0.023)	(0.023)	(0.023)
other partners						−0.006	0.004	0.008	0.007
						(0.027)	(0.027)	(0.027)	(0.026)
single						−0.016	−0.023	−0.020	−0.019
						(0.024)	(0.024)	(0.024)	(0.023)
STD times						0.004	−0.003	−0.004	−0.005
						(0.005)	(0.004)	(0.004)	(0.004)
STI screen						0.013*	0.006	0.006	0.005
						(0.007)	(0.008)	(0.008)	(0.009)
TB screen						0.003	0.005	0.004	0.004
						(0.004)	(0.004)	(0.004)	(0.004)
subjective probability							0.139***	0.142***	0.140***
							(0.031)	(0.032)	(0.033)
days since HCT began / 100								0.345	0.367*
								(0.212)	(0.207)
(days since HCT began / 100)^2								−0.137	−0.148*
								(0.091)	(0.089)
hourly paid workers								−0.005	−0.008
								(0.016)	(0.016)
years at Company								0.001	0.001
								(0.001)	(0.001)
HCT before									−0.028
									(0.017)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.016	0.115	0.135	0.136	0.142	0.153	0.22	0.233	0.241
n	1017	1014	1014	1010	1010	1008	976	961	961

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. MSP taker sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

Table A8: Infection Probit, HCT Sample, Marginal Effects

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	−0.121***	−0.555***	−0.512***	−0.498***	−0.494***	−0.512***	−0.373***	−0.455***	−0.448***
	(0.008)	(0.088)	(0.098)	(0.100)	(0.099)	(0.106)	(0.097)	(0.167)	(0.170)
arm (optout)	−0.005	−0.005	0.001	0.003	−0.002	−0.004	−0.002	−0.003	−0.001
	(0.014)	(0.013)	(0.013)	(0.013)	(0.010)	(0.009)	(0.009)	(0.012)	(0.012)
arm (assess)	−0.024	−0.026*	−0.023	−0.020	−0.020	−0.020	−0.012	−0.014	−0.013
	(0.016)	(0.015)	(0.015)	(0.015)	(0.014)	(0.013)	(0.011)	(0.012)	(0.011)
arm (supp)	−0.009	−0.010	−0.005	−0.005	−0.003	−0.004	0.000	−0.007	−0.007
	(0.013)	(0.012)	(0.012)	(0.012)	(0.010)	(0.009)	(0.010)	(0.013)	(0.013)
african / colored		0.272***	0.263***	0.263***	0.260***	0.240***	0.180***	0.180***	0.177***
		(0.028)	(0.028)	(0.032)	(0.029)	(0.027)	(0.026)	(0.027)	(0.029)
white / other		−0.002	−0.006	0.001	0.001	−0.013	−0.012	−0.004	0.001
		(0.002)	(0.028)	(0.011)	(0.007)	(0.012)	(0.013)	(0.013)	(0.012)
age / 10		0.098**	0.090**	0.084*	0.084*	0.094**	0.048	0.037	0.041
		(0.039)	(0.044)	(0.044)	(0.044)	(0.048)	(0.044)	(0.045)	(0.045)
(age / 10)^2		−0.011**	−0.010*	−0.010*	−0.010*	−0.010*	−0.005	−0.003	−0.003
		(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
BMI / 10		−0.001	−0.004	−0.004	−0.004	−0.008	−0.006	−0.005	−0.006
		(0.012)	(0.012)	(0.012)	(0.012)	(0.010)	(0.010)	(0.011)	(0.011)
number of bf gf		0.004	0.002	0.002	0.002	−0.004	−0.009	−0.008	−0.007
		(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.007)	(0.007)
higher primary				0.009	0.009	0.009	−0.001	0.002	0.006
				(0.018)	(0.019)	(0.018)	(0.016)	(0.018)	(0.016)
high school				−0.016	−0.016	−0.015	−0.027	−0.022	−0.017
				(0.021)	(0.021)	(0.021)	(0.019)	(0.021)	(0.019)
tertiary education				−0.234***	−0.234***	−0.214***	−0.186***	−0.187***	−0.185***
				(0.030)	(0.030)	(0.029)	(0.039)	(0.040)	(0.041)
master's degree				−0.005	−0.005	0.049	0.026	0.024	0.023
				(0.030)	(0.030)	(0.041)	(0.038)	(0.039)	(0.037)
arm (optout) * african / coloured					0.014	0.006	0.003	0.011	0.001
					(0.026)	(0.025)	(0.016)	(0.027)	(0.034)
arm (optout) * white / other					0.002	0.000	−0.026	−0.018	−0.017
					(0.028)	(0.030)	(0.035)	(0.048)	(0.056)
arm (assess) * african / coloured					−0.007	−0.003	0.014	0.023	0.011
					(0.027)	(0.027)	(0.021)	(0.027)	(0.030)
arm (assess) * white / other					−0.019	0.013	0.017	0.028	0.007
					(0.017)	(0.027)	(0.022)	(0.023)	(0.043)
arm (supp) * african / coloured					−0.007	−0.007	0.012	0.017	0.008
					(0.017)	(0.016)	(0.013)	(0.021)	(0.029)
arm (supp) * white / other					0.000	0.026	−0.003	0.009	0.004
					(0.016)	(0.026)	(0.036)	(0.036)	(0.027)
multiple partners						0.000	−0.001	−0.002	−0.004
						(0.013)	(0.012)	(0.012)	(0.013)
other partners						−0.056**	−0.053***	−0.054***	−0.058**
						(0.024)	(0.020)	(0.020)	(0.023)
single						0.030**	0.020*	0.017	0.012
						(0.012)	(0.012)	(0.012)	(0.012)
STD times						0.010**	0.006*	0.005	0.005
						(0.004)	(0.003)	(0.003)	(0.004)
STI screen						0.001	0.003	0.003	0.003
						(0.004)	(0.004)	(0.004)	(0.004)
TB screen						0.000	−0.002	−0.003	−0.002
						(0.003)	(0.003)	(0.003)	(0.003)
subjective probability							0.095***	0.096***	0.093***
							(0.025)	(0.025)	(0.025)
days since HCT began / 100								0.175	0.187
								(0.170)	(0.173)
(days since HCT began / 100)^2								−0.076	−0.080
								(0.070)	(0.071)
hourly paid workers								0.020	0.021
								(0.015)	(0.014)
years at Company								−0.001	−0.001
								(0.001)	(0.001)
HCT before									−0.025**
									(0.012)
area	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.008	0.203	0.254	0.271	0.271	0.316	0.414	0.425	0.445
n	1234	1231	1231	1226	1226	1224	1170	1156	1156

Notes
1. Cluster robust standard errors in parenthesis. Clusters are area × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}'\mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. HCT taker sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.

TABLE A9: UPTAKE PROBIT, MSP SAMPLE, MARGINAL EFFECTS, NURSE FIXED EFFECTS

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	0.167***	1.286***	1.447***	1.418***	1.383***	1.491***	1.268***	1.299***	1.287***
	(0.027)	(0.186)	(0.252)	(0.261)	(0.261)	(0.269)	(0.256)	(0.330)	(0.324)
arm (optout)	0.007	0.006	0.004	0.004	0.027	0.027	0.028	0.026	0.027
	(0.034)	(0.032)	(0.031)	(0.032)	(0.043)	(0.044)	(0.041)	(0.042)	(0.042)
arm (assess)	0.061*	0.049	0.044	0.043	0.045	0.045	0.042	0.029	0.031
	(0.036)	(0.034)	(0.034)	(0.034)	(0.038)	(0.039)	(0.037)	(0.038)	(0.038)
arm (supp)	0.063*	0.068**	0.059*	0.057*	0.172***	0.171***	0.154***	0.149***	0.149***
	(0.034)	(0.032)	(0.031)	(0.032)	(0.041)	(0.041)	(0.039)	(0.041)	(0.041)
african / colored		−0.432***	−0.423***	−0.420***	−0.422***	−0.411***	−0.324***	−0.310***	−0.315***
		(0.054)	(0.054)	(0.055)	(0.056)	(0.056)	(0.053)	(0.054)	(0.054)
white / other		−0.080	−0.096	−0.103	0.087	0.092	0.086	0.088	0.082
		(0.086)	(0.089)	(0.088)	(0.079)	(0.079)	(0.074)	(0.078)	(0.078)
age / 10		−0.391***	−0.397***	−0.387***	−0.384***	−0.416***	−0.323***	−0.316***	−0.321***
		(0.091)	(0.094)	(0.094)	(0.095)	(0.101)	(0.101)	(0.102)	(0.100)
(age / 10)^2		0.050***	0.050***	0.049***	0.049***	0.052***	0.041***	0.038***	0.039***
		(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
BMI / 10		−0.036*	−0.030	−0.030	−0.033	−0.034	−0.039**	−0.040**	−0.039**
		(0.021)	(0.020)	(0.021)	(0.021)	(0.021)	(0.020)	(0.019)	(0.019)
number of bf gf		−0.020	−0.020	−0.020	−0.020	−0.006	0.001	−0.001	−0.003
		(0.013)	(0.013)	(0.013)	(0.013)	(0.020)	(0.019)	(0.019)	(0.019)
higher primary				−0.005	−0.004	−0.008	−0.024	−0.019	−0.021
				(0.035)	(0.035)	(0.035)	(0.035)	(0.036)	(0.035)
high school				0.014	0.015	0.010	−0.003	−0.024	−0.031
				(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
tertiary education				0.029	0.039	0.020	−0.007	−0.097	−0.087
				(0.174)	(0.174)	(0.176)	(0.177)	(0.181)	(0.185)
arm (optout) * african / coloured					−0.063	−0.060	−0.065	−0.036	−0.042
					(0.157)	(0.156)	(0.146)	(0.146)	(0.146)
arm (optout) * white / other					0.103	0.112	0.087	0.128	0.114
					(0.248)	(0.247)	(0.232)	(0.237)	(0.236)
arm (assess) * african / coloured					0.065	0.065	0.054	0.064	0.074
					(0.138)	(0.137)	(0.130)	(0.130)	(0.131)
arm (assess) * white / other					0.267	0.271	0.253	0.261	0.257
					(0.198)	(0.197)	(0.186)	(0.189)	(0.190)
arm (supp) * african / coloured					−0.050	−0.048	−0.056	−0.048	−0.052
					(0.152)	(0.152)	(0.140)	(0.141)	(0.140)
arm (supp) * white / other					1.095***	1.088***	1.001***	0.984***	0.965***
					(0.198)	(0.198)	(0.186)	(0.190)	(0.189)
multiple partners						−0.007	0.002	−0.000	0.006
						(0.037)	(0.036)	(0.036)	(0.036)
other partners						0.061	0.045	0.044	0.040
						(0.048)	(0.047)	(0.047)	(0.048)
single						−0.059*	−0.039	−0.032	−0.032
						(0.034)	(0.033)	(0.033)	(0.034)
STD times						−0.007	−0.005	−0.004	−0.003
						(0.012)	(0.015)	(0.015)	(0.016)
STI screen						−0.011	0.002	0.002	0.004
						(0.015)	(0.016)	(0.017)	(0.017)
TB screen						−0.005	−0.003	−0.003	−0.004
						(0.007)	(0.007)	(0.007)	(0.007)
subjective probability							−0.259***	−0.259***	−0.260***
							(0.047)	(0.046)	(0.046)
days since HCT began / 100								0.115	0.098
								(0.343)	(0.346)
(days since HCT began / 100)^2								−0.084	−0.075
								(0.143)	(0.145)
hourly paid workers								−0.039	−0.034
								(0.028)	(0.028)
years at Company								0.001	0.001
								(0.002)	(0.002)
HCT before									0.056**
									(0.025)
nurse	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.004	0.112	0.13	0.13	0.133	0.139	0.166	0.173	0.176
n	1404	1387	1387	1382	1382	1377	1294	1274	1274

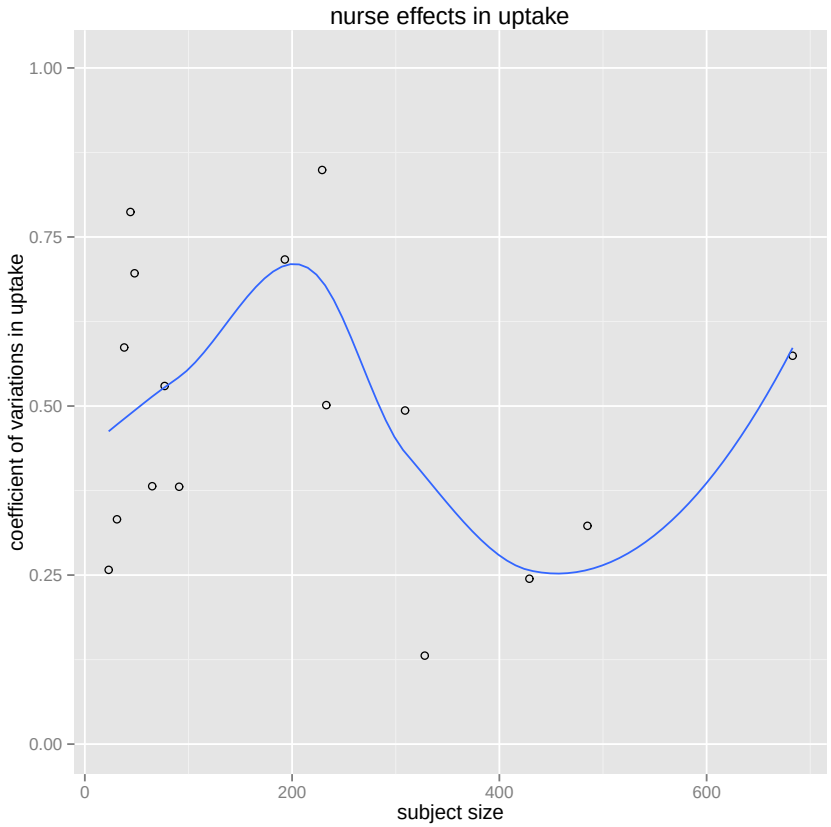
Notes
1. Cluster robust standard errors in parenthesis. Clusters are nurse × date.
2. *, **, *** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}' \mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. MSP sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.
6. Nurse fixed effects are used in place of area fixed effects.

TABLE A10: UPTAKE PROBIT, HCT SAMPLE, MARGINAL EFFECTS, NURSE FIXED EFFECTS

covariates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Intercept)	0.196***	0.599***	0.998***	1.015***	1.016***	1.066***	1.036***	0.950***	0.951***
	(0.022)	(0.147)	(0.163)	(0.151)	(0.149)	(0.156)	(0.153)	(0.179)	(0.181)
arm (optout)	−0.003	0.002	−0.005	−0.005	0.008	0.011	0.009	0.011	0.011
	(0.022)	(0.022)	(0.021)	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)	(0.021)
arm (assess)	−0.014	−0.007	−0.007	−0.009	−0.009	−0.009	−0.009	−0.006	−0.007
	(0.019)	(0.019)	(0.017)	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)
arm (supp)	−0.013	−0.008	−0.013	−0.012	−0.010	−0.013	−0.014	−0.018	−0.018
	(0.020)	(0.020)	(0.019)	(0.019)	(0.018)	(0.018)	(0.018)	(0.022)	(0.021)
african / colored		−0.080***	−0.087***	−0.091***	−0.089***	−0.083***	−0.055***	−0.056***	−0.055***
		(0.020)	(0.019)	(0.018)	(0.019)	(0.019)	(0.018)	(0.019)	(0.019)
white / other		−0.052**	−0.050**	−0.044*	−0.020	−0.016	−0.013	−0.006	−0.006
		(0.026)	(0.025)	(0.024)	(0.026)	(0.026)	(0.024)	(0.023)	(0.023)
age / 10		−0.190***	−0.166**	−0.156**	−0.165**	−0.196**	−0.175**	−0.175**	−0.173**
		(0.073)	(0.075)	(0.072)	(0.073)	(0.078)	(0.074)	(0.080)	(0.081)
(age / 10)^2		0.024**	0.021**	0.019**	0.020**	0.023**	0.020**	0.019*	0.018*
		(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)
BMI / 10		−0.015	−0.007	−0.007	−0.008	−0.003	0.003	0.004	0.004
		(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)
number of bf gf		0.007	0.007	0.008	0.008	−0.000	0.003	0.004	0.004
		(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.008)	(0.007)	(0.007)
higher primary				−0.047	−0.050	−0.043	−0.031	−0.020	−0.020
				(0.038)	(0.036)	(0.035)	(0.032)	(0.034)	(0.035)
high school				−0.023	−0.028	−0.024	−0.012	0.003	0.003
				(0.038)	(0.036)	(0.034)	(0.032)	(0.035)	(0.036)
tertiary education				−0.031	−0.031	−0.022	−0.015	0.003	0.004
				(0.043)	(0.041)	(0.039)	(0.035)	(0.040)	(0.040)
master's degree				−0.113**	−0.114**	−0.114**	−0.105**	−0.090*	−0.089*
				(0.056)	(0.055)	(0.056)	(0.051)	(0.052)	(0.052)
arm (optout) * african / coloured					−0.030	−0.010	−0.012	−0.009	−0.008
					(0.055)	(0.053)	(0.049)	(0.050)	(0.050)
arm (optout) * white / other					−0.142**	−0.127**	−0.122**	−0.120**	−0.119**
					(0.064)	(0.064)	(0.059)	(0.059)	(0.059)
arm (assess) * african / coloured					−0.013	−0.005	−0.043	−0.039	−0.038
					(0.046)	(0.046)	(0.043)	(0.044)	(0.044)
arm (assess) * white / other					−0.047	−0.043	−0.068	−0.072	−0.072
					(0.068)	(0.068)	(0.062)	(0.061)	(0.061)
arm (supp) * african / coloured					−0.036	−0.028	−0.035	−0.028	−0.029
					(0.048)	(0.048)	(0.044)	(0.045)	(0.045)
arm (supp) * white / other					0.008	0.015	0.008	0.009	0.010
					(0.068)	(0.070)	(0.064)	(0.063)	(0.063)
multiple partners						0.062**	0.055*	0.051*	0.050*
						(0.024)	(0.029)	(0.028)	(0.028)
other partners						−0.009	−0.007	−0.008	−0.008
						(0.028)	(0.028)	(0.029)	(0.029)
single						−0.033**	−0.024	−0.025	−0.025
						(0.016)	(0.016)	(0.016)	(0.016)
STD times						−0.011**	−0.006	−0.007	−0.007
						(0.005)	(0.005)	(0.005)	(0.005)
STI screen						−0.003	−0.002	−0.004	−0.004
						(0.007)	(0.007)	(0.007)	(0.007)
TB screen						−0.005	−0.004	−0.003	−0.003
						(0.005)	(0.005)	(0.005)	(0.005)
subjective probability							−0.144***	−0.143***	−0.142***
							(0.027)	(0.027)	(0.027)
days since HCT began / 100								0.094	0.096
								(0.204)	(0.202)
(days since HCT began / 100)^2								−0.036	−0.037
								(0.085)	(0.085)
hourly paid workers								0.023	0.022
								(0.019)	(0.019)
years at Company								0.002	0.002
								(0.001)	(0.001)
HCT before									−0.008
									(0.016)
nurse	no	no	yes	yes	yes	yes	yes	yes	yes
pseudo R^2	0.001	0.067	0.147	0.161	0.178	0.206	0.27	0.276	0.277
n	1318	1315	1313	1308	1308	1306	1246	1231	1231

Notes
1. Cluster robust standard errors in parenthesis. Clusters are nurse × date.
2. *, **,*** indicate statistical significance at 10%, 5%, 1% levels, respectively.
3. Estimates show marginal impacts on uptake probabilities computed with $\frac{\partial p}{\partial x_{ij}} = \sum_{i=1}^{n} \frac{\phi(\boldsymbol{\beta}' \mathbf{x}_i)\beta_j}{n}$. Standard errors are derived with delta method.
4. Default ethnicity category is Indians. All interaction terms are demeaned. area indicates the use of area fixed effects.
5. HCT sample only. Sample dropped plausibly knowing HIV infected individuals who are not tested but answers "know about my status", tested positive in prevalence study, and own subjective probability of infection is 1.
6. Nurse fixed effects are used in place of area fixed effects.

FIGURE A1: COEFFICIENT OF VARIATIONS OF UPTAKE BY NURSE AND ETHNICITY



Notes 1. Coefficient of variations in uptake by nurse-ethnicity combination.
2. Nurses-ethnicity with less than 20 subjects are discarded due to small sample.

F Organizational concerns

Company consists of three layers of employees; executives, salaried employees, and hourly paid employees. By the job type, former two correspond to administrative positions, and the hourly paid employees are production employees. In a manufacturing firm, HIV testing has an immediate impact on production, because it takes employees away from the production line.

In each production area, a daily production target is given. If there is a testing, general managers (GMs) of areas must organize a plan to substitute the employees that are taken off from the production line. Some areas are chronically short of employees, and have faced a greater difficulty in releasing employees for testing. We have asked each area GMs to accommodate testing, and allocated dates that will not interfere with their daily production targets. GMs assigned coordinators from their area to manage the employee movements while maintaining production flows.

Even when the GMs can figure out the plans, production is subject to demand changes and supplier shocks, so daily production target varies by day and may not be foreseen well in advance. This makes it difficult to share a definitive plan for HIV testing with the health care providers. For example, there were major strikes by the port and public transportation employees in 2010 which put an enormous strain on production line, and have resulted in reducing the number of employees who can be taken off. In light o this, we have tried to diversify the burden and risks by bunching neighboring areas.

When one area faces unforeseen employee shortage, as they often do, the neighboring area is asked to release extra employees, so the employee release target is achieved.

While we received an approval to run the interventions from CEO at the onset, we still had to get an approval from the board members. Company Health Services and IDE research team have formed a task force to plan the interventions. The task force drafted intervention plans that are seamlessly connected with existing infrastructure and health programs, and explained them repeatedly to managerial personnel.

The task force has asked the trade unions to work with us to accommodate and promote testing. We received supports from their representatives right from the beginning. Shop stewards (union representatives) were particularly concerned with confidentiality of testing and equal treatment among their member employees, which we promised to maintain.

From KAPB study, we knew that Company Health Services has a reputation of keeping individual information confidential. We confirmed with lawyers that Company MS maintains the privilege to record the HIV related information of all employees, so we can ask names and offer a test, but at the same time Company MS is bound by doctor-patient privilege and will be legally punished if information is submitted to any other personnel inside and outside of Company. So all information related to individual identity is stripped by Company MS before we receive the data set.

In a hope to boost the uptake in short period of time, Company hired EAP service providers to implement the interventions. Through them, Company hired nurses and receptionists. Company also leased in mobile clinic units and other equipments. IDE research team has provided protocols and other documentations. Data was captured by EAP and information related to individual identity was deleted by Company MS before being sent to IDE research team.